

# Knee Exercise List (No-Equipment, Home-Based)

**Overview:** The following **50 knee-friendly exercises** are suited for general fitness, especially for individuals with knee issues. They require **no equipment** (beyond common household items like a chair or wall) and can be done at home. Each exercise includes a *difficulty level*, recommended *sets and repetitions* (often given as ranges to allow future algorithmic adjustment), and a brief description. Remember to **warm up** before starting and **stop** any exercise that causes sharp pain. It's advisable to consult a healthcare professional for personalized guidance [1](#) [2](#).

## Stretching and Mobility Exercises

1. **Heel and Calf Stretch** (*Difficulty: Beginner*) – *Reps/Sets:* 2 sets of a **30-second hold** per leg. Stand facing a wall in a staggered stance (one leg back, heel flat). With hands on the wall, **lean forward** until you feel a stretch in the calf of the back leg [3](#). Keep both heels down and knees slightly bent. Hold for 30 seconds, then switch legs and repeat [4](#). This stretch loosens the calf (gastrocnemius-soleus) muscle and Achilles tendon to improve ankle mobility and reduce knee strain [5](#) [6](#).
2. **Standing Quadriceps Stretch** (*Difficulty: Beginner*) – *Reps/Sets:* 2-3 sets of a **30-60 second hold** per leg. Stand upright and, using a wall or chair for balance, **bend one knee** to bring your heel toward your buttocks. Grasp your ankle and gently pull the heel closer to your body until you feel a stretch in the front of your thigh (quadriceps). Keep your knees close together and avoid arching your back [7](#). Hold for 30-60 seconds, then switch legs. This stretch improves quad and hip flexor flexibility [8](#) [9](#), which can alleviate tension on the knee.
3. **Supine Hamstring Stretch** (*Difficulty: Beginner*) – *Reps/Sets:* 2-3 sets of a **30-second hold** per leg. Lie on your back (on the floor or a mat) with one leg flat on the floor and the other raised. Loop your hands (or a towel) behind the raised thigh (below the knee) [10](#) [11](#). Gently **straighten the raised leg** toward the ceiling until you feel a stretch along the back of the thigh [12](#). Hold ~30 seconds without pain, then lower and switch legs. This stretch targets the hamstrings, improving flexibility behind the knee [13](#) [14](#).
4. **Kneeling Hip Flexor Stretch** (*Difficulty: Beginner*) – *Reps/Sets:* 2 sets of a **20-30 second hold** per side. Start in a half-kneeling lunge: one knee on the ground and the opposite foot forward (front knee ~90°). Keep your torso upright. **Tuck your hips forward** (engage your glutes) and gently shift your weight forward until you feel a stretch in the front of the hip of the kneeling leg [15](#). Avoid arching your lower back. Hold ~30 seconds, then switch legs. Stretching tight hip flexors can relieve pressure on the knee by improving hip mobility [16](#) [17](#).
5. **IT Band Stretch (Standing Cross-Over)** (*Difficulty: Beginner*) – *Reps/Sets:* 2 sets of a **20-30 second hold** per side. Stand upright and **cross your right leg behind your left**. Reach your right arm overhead and lean your torso to the left side until you feel a stretch along the **outer right thigh** and hip [18](#) [19](#). Hold ~20+ seconds, then switch (cross left behind right and lean right). This stretch targets the iliotibial band, helping alleviate tightness on the outer knee (common in runner's knee) [20](#) [21](#).

- 6. Figure-Four Glute Stretch** (*Difficulty: Beginner*) – *Reps/Sets:* 2 sets of a **20–30 second hold** per side. Lie on your back with knees bent. Cross one ankle over the opposite knee (forming a “4”). Grasp behind the thigh of the uncrossed leg and **gently pull** that leg toward your chest <sup>22</sup> <sup>23</sup>. You should feel a stretch in the buttock/outer hip of the crossed leg. Hold ~30 seconds and switch sides. This stretch (often used for piriformis and glutes) can ease tension that may contribute to knee pain <sup>22</sup> <sup>24</sup>.
- 7. Double Knee-to-Chest Stretch** (*Difficulty: Beginner*) – *Reps/Sets:* **5–10 repetitions**, holding each for ~5–10 seconds. Lie flat on your back. Keeping your core relaxed, **bring both knees toward your chest** and gently hug them with your arms <sup>25</sup>. Hold the stretch for a few seconds (you’ll feel it in your lower back and possibly hips), then slowly release your legs back to flat. Repeat for the desired reps. This exercise helps relieve lower back tension and increases overall knee and hip flexibility <sup>26</sup> <sup>27</sup> (it targets hip flexors and low back muscles supporting the knee).
- 8. Heel Slide Knee Bend** (*Difficulty: Beginner*) – *Reps/Sets:* **10–15 repetitions** per leg, 2–3 sets. Lie on your back with legs outstretched (or sit on the floor with legs forward). Slowly **slide one heel toward your buttocks**, bending the knee as far as comfortable <sup>28</sup>. Hold the bent position for ~5 seconds, then slide the foot forward again to straighten the leg <sup>29</sup>. Repeat 10+ times each side. Heel slides improve knee **range of motion** and gently lubricate the joint <sup>30</sup> <sup>31</sup>, which is especially useful if stiffness is an issue (such as after injury or surgery).
- 9. Unweighted Leg Cycle (Air Cycling)** (*Difficulty: Beginner*) – *Reps/Sets:* Cycle for **30–60 seconds** continuously, 2–3 sets. Lie on your back and lift both legs off the floor with knees bent. Perform a gentle **cycling motion** in the air, as if pedaling an invisible bicycle <sup>32</sup> <sup>33</sup>. Focus on moving each knee through a full bend and straighten without pain. This low-impact movement increases blood flow, improves knee joint range of motion, and reduces stiffness <sup>34</sup> <sup>35</sup>. Start slowly and increase duration as flexibility improves <sup>36</sup> <sup>37</sup>.
- 10. Standing Knee Marches** (*Difficulty: Beginner*) – *Reps/Sets:* **10–20 marches** per side, 2 sets. Stand tall (hold a chair or wall for support if needed). **March in place** by lifting one knee to hip level (or as high as comfortable) <sup>38</sup>, then lowering and repeating with the opposite leg in an alternating fashion. Keep your back straight and engage your core for balance. Aim to briefly hold each knee up for 1–2 seconds. This exercise activates the hip flexors and warms up the knees through a fluid range of motion (it’s essentially a high-knee march in a controlled manner) <sup>39</sup>. It can also help improve balance on each leg.

## Strengthening Exercises (No Equipment)

- 1. Static Quadriceps Set** (*Difficulty: Beginner*) – *Reps/Sets:* **10–15 repetitions**, holding each contraction ~5–10 seconds, 2–3 sets. Sit or lie with your leg extended straight. Place a rolled towel under your knee (or simply keep the leg flat) and **tighten your thigh muscle**, pressing the back of your knee downward <sup>40</sup> <sup>41</sup>. Your knee will straighten and the quadriceps will contract (the kneecap might lift slightly when engaged). Hold for a few seconds, then relax. Repeat on each leg. This **isometric quad exercise** strengthens the muscle above the knee (quadriceps) without moving the joint, which is great for early rehab or reducing knee pain <sup>42</sup> <sup>43</sup>.
- 2. Short-Arc Knee Extension** (*Difficulty: Beginner*) – *Reps/Sets:* **10–15 repetitions** per leg, 2–3 sets. Sit on the floor or bed with a rolled towel or foam roll under one knee. The knee should be slightly bent over the roll. From this position, **lift your foot** by straightening the knee until the leg is nearly straight <sup>44</sup>. Squeeze the quad at the top for ~2 seconds, then slowly lower the foot

back down. Repeat on the other leg. Known as short-arc quads or **supported leg raises**, this exercise focuses on the last part of knee extension and the VMO muscle for knee stability <sup>45</sup>  
<sup>46</sup>. Aim for ~3 sets of 10 reps as it gets easier <sup>47</sup> <sup>48</sup>.

**3. Straight-Leg Raise (Supine)** (*Difficulty: Beginner*) – **Reps/Sets: 10 repetitions** per leg, 2-3 sets. Lie flat on your back with one leg bent (foot on floor) and the other leg straight. **Tighten the quad** of the straight leg and slowly **raise it** ~6-12 inches off the floor, keeping the knee straight <sup>49</sup>  
<sup>50</sup>. Hold for 5 seconds at the top, then lower it down with control. Do all reps on each leg. This exercise strengthens the quadriceps and hip flexors while keeping pressure off the knee joint <sup>51</sup>  
<sup>52</sup>. **Tip:** Don't swing or use momentum – lift and lower in a controlled manner <sup>53</sup> <sup>54</sup>.

**4. Straight-Leg Raise (Seated)** (*Difficulty: Beginner*) – **Reps/Sets: 10 repetitions** per leg, 2-3 sets. Sit upright in a chair with both feet on the floor. Extend one knee to **lift the lower leg** until it's parallel to the ground (straight out in front) <sup>55</sup> <sup>56</sup>. Hold it straight for ~5 seconds, focusing on contracting the thigh muscle, then slowly lower the foot back down. Repeat on the other leg. This seated leg extension exercise works the quads without added weight, and holding at the top helps build endurance in the knee extensors <sup>57</sup> <sup>58</sup>. (As strength improves, you can add a light ankle weight to increase difficulty <sup>59</sup> <sup>60</sup>.)

**5. Wall Sit** (*Difficulty: Intermediate*) – **Reps/Sets: 3-5 repetitions**, holding each for **15-30 seconds** (build up to longer holds). Stand with your back against a wall and feet about 2 feet in front of you, shoulder-width apart. Slide down the wall until your knees are bent around 90° (as if sitting in an invisible chair) and hold that position <sup>61</sup> <sup>62</sup>. Keep your knees behind your toes and don't drop lower than a 90° knee angle if you have knee pain. Hold the squat position, feeling the quads work, then push through your heels to slide back up. Wall sits are an **isometric quad exercise** that builds strength and endurance in the thighs without moving the knee joint <sup>61</sup> <sup>63</sup> (great for patellofemoral pain management). Start with shorter holds and gradually increase as tolerated.

**6. Partial Squat (Half Squat)** (*Difficulty: Beginner*) – **Reps/Sets: 10 repetitions**, 2-3 sets. Stand with feet shoulder-width apart. With hands on hips or forward for balance, **bend your knees and hips** as if sitting back into a chair, but only go about *halfway down* (~45° knee bend) <sup>64</sup>. Ensure your knees stay behind your toes and don't collapse inward. Pause briefly, then push through your heels to stand back up <sup>65</sup> <sup>66</sup>. Half squats strengthen the quadriceps, glutes, and hamstrings while minimizing knee stress by avoiding deep flexion <sup>67</sup> <sup>68</sup>. Aim for 2-3 sets of 10; as you get stronger, you can increase depth slightly or transition to full squats.

**7. Full Bodyweight Squat** (*Difficulty: Advanced*) – **Reps/Sets: 8-12 repetitions**, 2-3 sets. Stand with feet about hip-width apart, toes pointing slightly outward. Keeping your chest up and back straight, **squat down** by bending your knees and hips until your thighs are about parallel to the floor (or as low as comfortable) <sup>69</sup> <sup>70</sup>. Your knees should track in line with your toes (avoid letting them cave inward) <sup>70</sup>. Push through your heels to return to standing. Full squats engage the quads, hamstrings, and glutes through a larger range, building strength and mobility <sup>71</sup>  
<sup>72</sup>. Only perform full-depth squats if you have the flexibility and it doesn't cause pain – otherwise, stick to partial squats and gradually increase depth <sup>72</sup> <sup>73</sup>.

**8. Sit-to-Stand (Chair Rise)** (*Difficulty: Beginner*) – **Reps/Sets: 10-15 repetitions**, 2-3 sets. Sit on a sturdy chair with your feet shoulder-width apart and slightly behind your knees. Cross your arms over your chest (or use them for momentum if needed initially). **Stand up** from the chair by driving through your heels, then slowly lower yourself back down to a seated position under control <sup>74</sup> <sup>75</sup>. Try not to use your hands to push off, if possible. Repeat for reps. This functional

exercise strengthens the quads and glutes and mimics everyday movements, helping improve knee extension power and balance <sup>76</sup> <sup>74</sup>. If the chair is low and difficult, start with a higher surface or add a cushion, then remove it as you get stronger.

9. **Step-Ups** (*Difficulty: Intermediate*) – Reps/Sets: **8-12 repetitions** per leg, 2-3 sets. Use a stair or a step (~6-8 inches high to start). **Step up** onto the platform with your right foot, pressing through the heel, and bring your left foot up to join (fully straightening the right knee) <sup>77</sup> <sup>78</sup>. Then step down carefully, right foot first followed by left. Repeat for the desired reps, then switch leading legs. Keep the movement controlled and use a railing or wall for balance if needed. Step-ups strengthen the quadriceps, hamstrings, and glutes in a motion similar to climbing stairs <sup>77</sup> <sup>79</sup>. Start with a low step and increase height as strength improves. (*For example, begin with ~3 sets of 5 each leg and build up* <sup>79</sup>.)
10. **Step-Downs** (*Difficulty: Intermediate*) – Reps/Sets: **8-12 repetitions** per leg, 2 sets. Begin standing on a step or low platform with both feet. **Step down** slowly by lowering one foot to the floor in front of the step – focus on the *eccentric* control of the leg remaining on the step (it's essentially a reverse step-up) <sup>80</sup> <sup>81</sup>. Lightly tap your heel to the ground, then push back up with the leg on the step. Perform all reps on one side, then switch. Keep your knee aligned over your toes (don't let it cave inward) during the lowering <sup>82</sup> <sup>83</sup>. Step-downs strengthen the quads (especially the VMO) and glutes while training knee stability and control, which is useful for activities like descending stairs <sup>84</sup> <sup>85</sup>. Start with a small step height and increase as you get stronger <sup>86</sup> <sup>87</sup>.
11. **Forward Lunge** (*Difficulty: Intermediate*) – Reps/Sets: **8-12 repetitions** per leg, 2 sets. Stand upright, hands on hips. Take a big **step forward** with your right foot and **bend both knees** to approximately 90° (front knee over ankle, back knee lowering toward the floor) <sup>88</sup> <sup>89</sup>. Ensure your front knee does not travel past your toes. Push through the heel of your front foot to return to standing, bringing the front leg back. Repeat on the left. Forward lunges work the quads, hamstrings, and glutes, and also challenge balance and knee stability <sup>88</sup> <sup>90</sup>. If a full lunge is too strenuous, start with a *partial lunge* (shallower depth) <sup>91</sup>. Maintain proper form to avoid unnecessary knee stress – the movement should be controlled and pain-free.
12. **Reverse Lunge** (*Difficulty: Intermediate*) – Reps/Sets: **8-12 repetitions** per leg, 2 sets. From standing, **step one foot backward** and lower into a lunge (back knee toward the floor) while the front knee bends ~90°. For example, step your right foot back, keeping your weight mostly on the left (front) leg. Push through the left heel to return to standing, bringing the right foot forward to the start. Then alternate or do all reps on one side. Reverse lunges are slightly more knee-friendly for some, as the front knee tends to stay more stable over the foot. They effectively strengthen the quads, glutes, and hamstrings similarly to forward lunges, but with possibly less forward knee shear force <sup>88</sup> <sup>92</sup>. Keep your torso upright and core engaged throughout.
13. **Lateral Lunge (Side Lunge)** (*Difficulty: Intermediate*) – Reps/Sets: **8-12 repetitions** per side, 2 sets. Stand with feet hip-width. Take a big **step to the right**, bending your right knee and pushing your hips back, while your left leg stays straight. Lower until your right thigh is near parallel to the floor (or comfortable) and your weight is over the right heel, then push back up to center <sup>93</sup> <sup>94</sup>. Repeat on the left side. Throughout the move, keep your chest up and ensure the bent knee tracks over the toes (not caving inward). Lateral lunges target the glutes, quads, and inner thighs, and improve lateral hip strength and knee stability in side-to-side motions <sup>93</sup> <sup>95</sup>. Start shallow and gradually increase depth as flexibility and strength improve.

14. **Single-Leg Squat (Pistol Squat, Assisted)** (*Difficulty: Advanced*) – *Reps/Sets: 5–8 repetitions* per leg, 2 sets. Stand on one foot and extend the other leg slightly forward off the ground. Use a chair back or wall for light support if needed. **Bend your standing leg** and push your hips back to squat on that one leg as low as you can *with good form* 96 97 (even a 30–45° bend is a good start) and then return to standing. Keep the knee aligned over the foot. This is an advanced move requiring significant strength and balance – it intensely works the quads, glutes, and hamstrings of the standing leg 98 97. In practice, many will do *assisted pistol squats* (e.g. holding a suspension strap or counter) to offload some weight 99 100. Start with partial single-leg squats or **Bulgarian split squats** (next exercise) before attempting full pistols. Always prioritize control and avoid knee wobble.
15. **Standing Hamstring Curl** (*Difficulty: Beginner*) – *Reps/Sets: 10 repetitions* per leg, 2–3 sets. Stand holding the back of a chair or wall for support. Keep thighs aligned and **bend one knee**, bringing your heel toward your buttocks as far as comfortable 101 102. Hold for 1–2 seconds, then slowly lower the foot. Ensure your knees stay close together and avoid swinging your leg. Repeat on the other side. This exercise isolates the hamstrings (back of thigh) and also engages the glutes, without requiring any weight 103 101. To increase difficulty, you could eventually add an ankle weight, but even unweighted curls help strengthen the hamstrings and support the knee 104 105. Aim for controlled motion – you can place a hand on the hamstrings to feel them contract.
16. **Prone Hamstring Curl** (*Difficulty: Beginner*) – *Reps/Sets: 10 repetitions* per leg, 2 sets. Lie on your stomach (prone) on a mat or comfortable surface. Keep your legs straight and core engaged. **Bend one knee**, bringing your heel up toward your buttocks as far as possible without pain 106 107. Hold briefly, then lower the leg back down. Alternate legs or do all reps on one side then switch. Prone hamstring curls target the hamstrings similarly to standing curls, but in a lying position which may reduce strain on the lower back and allow a fuller range of motion. Focus on keeping your hips down and **not arching your back** as you curl 108 106. As a variation, you can curl both legs together for symmetry, though one at a time allows concentration on form.
17. **Glute Bridge** (*Difficulty: Beginner*) – *Reps/Sets: 10–15 repetitions*, 2–3 sets. Lie on your back with knees bent and feet flat on the floor about hip-width apart. **Lift your hips** by pressing through your heels, creating a straight line from shoulders to knees at the top 109 110. Squeeze your glutes at the top and ensure your knees stay in line with your feet (don't splay outward or inward) 111. Hold ~2 seconds, then slowly lower your buttocks back down. Bridges strengthen the glutes and hamstrings, which in turn support the knee by improving hip stability and taking strain off the quads 112 113. This exercise is generally knee-friendly since it involves no knee movement but still engages the posterior chain.
18. **Single-Leg Bridge** (*Difficulty: Advanced*) – *Reps/Sets: 8–10 repetitions* per leg, 2 sets. Set up in the bridge position (lying on back, knees bent). Extend one leg straight out so only the other leg bears weight. **Push your hips up** using the one planted foot, lifting until your body forms a straight line from shoulder to knee of the working leg. Avoid letting your hips dip or rotate. Lower back down and repeat, then switch legs. Single-leg bridges greatly increase the demand on the hamstrings and glutes of the stance leg, and also engage the core for stability. They help identify and improve any left-right strength imbalances that could affect knee alignment. *Tip:* If too hard initially, do a regular bridge and simply **lift one foot briefly at the top** to shift weight to one leg, then alternate. Move to full single-leg bridges as you get stronger.
19. **Prone Leg Raise (Hip Extension)** (*Difficulty: Beginner*) – *Reps/Sets: 10 repetitions* per leg, 2–3 sets. Lie on your stomach with legs straight. Keeping one leg straight, **lift it off the ground**

toward the ceiling ~6–12 inches (while keeping your hips down) <sup>114</sup> <sup>115</sup>. Squeeze your buttock at the top and feel your hamstrings engage, then lower the leg back down. Repeat on the other side. This exercise targets the glutes and hamstrings without bending the knee (also known as a prone straight-leg raise) <sup>116</sup> <sup>117</sup>. It can help improve hip extension strength which contributes to better support for the knee joint. As it gets easier, you can add a light ankle weight to increase resistance <sup>118</sup> <sup>60</sup>. Keep the movement small and controlled – the focus is on muscle activation, not height of the leg lift.

20. **Donkey Kicks (Quadruped Hip Extension)** (*Difficulty: Beginner*) – **Reps/Sets: 10–15 repetitions** per leg, 2 sets. Begin on all fours (hands under shoulders, knees under hips). Keeping the knee **bent 90°**, lift your right leg by driving the sole of your foot upward toward the ceiling (as if “kicking” the ceiling with the bottom of your foot) <sup>119</sup> <sup>120</sup>. Lift until your thigh is roughly in line with your torso or you feel your lower back is about to arch. Squeeze the glute at the top, then lower the knee back down. Do all reps with the right leg, then switch to the left. Donkey kicks strengthen the glutes and hamstrings while engaging core stability, which can improve overall support for the knees during activities. Keep your hips level (avoid twisting) and the motion controlled. This exercise is effective for isolating glute max activation without putting pressure on the knees.
21. **Fire Hydrants (Quadruped Hip Abduction)** (*Difficulty: Beginner*) – **Reps/Sets: 10–15 repetitions** per leg, 2 sets. On all fours, keeping the knee bent, **lift your right thigh out to the side** (like a dog at a fire hydrant) as high as comfortable <sup>121</sup> <sup>122</sup>. You should feel the outer hip (gluteus medius) working. Don’t twist your body – only the hip moves. Pause briefly at the top, then bring the knee back down. Repeat on the left. Fire hydrants strengthen the hip abductors, which help stabilize the pelvis and knee during walking and running <sup>123</sup> <sup>124</sup>. Strong hip abductors can prevent knee valgus (inward collapse) that contributes to knee pain <sup>125</sup> <sup>126</sup>. Start with a modest range of motion; as you get stronger, you may lift the leg higher or add an ankle weight for more challenge.
22. **Side-Lying Leg Raise (Hip Abduction)** (*Difficulty: Beginner*) – **Reps/Sets: 10–15 repetitions** per side, 2–3 sets. Lie on one side with legs straight and stacked. Support your head with your lower arm. **Raise your top leg** straight upward about 30–45°, keeping the knee straight and toes pointing forward <sup>127</sup> <sup>128</sup> (avoid rotating the leg open). You should feel the outer hip (gluteus medius) working. Slowly lower the leg back down. Do all reps, then switch sides. Side-lying leg raises strengthen the hip abductors and glutes, which in turn support the knee by improving lateral stability <sup>129</sup> <sup>130</sup>. As you progress, you can add a 1–5 lb ankle weight to increase resistance <sup>118</sup> <sup>131</sup>. Aim for about 2–3 sets of 10–20 reps as recommended in some conditioning programs <sup>132</sup> <sup>133</sup>.
23. **Clamshells** (*Difficulty: Beginner*) – **Reps/Sets: 10–15 repetitions** per side, 2 sets. Lie on your side with legs **bent at 90°** (knees and hips stacked). Keep your feet together. While heels stay touching, **lift your top knee** upward, opening your legs like a clamshell, without moving your pelvis <sup>134</sup> <sup>135</sup>. Only go as far as you can without rotating your back or hips. Then lower the knee back down. This exercise targets the gluteus medius and other hip stabilizers (external rotators), which are crucial for knee alignment during movement <sup>124</sup> <sup>136</sup>. Clamshells help reduce stress on the IT band and knee by strengthening the muscles that prevent inward knee collapse <sup>124</sup> <sup>137</sup>. For best results, focus on form (a smaller movement with proper muscle engagement is better than a large movement with hip rolling).
24. **Standing Hip Abduction** (*Difficulty: Beginner*) – **Reps/Sets: 10–15 repetitions** per leg, 2 sets. Stand side-on to a chair or wall for support. **Lift one leg out to the side** (hip abduction) about 30°

away from the standing leg, keeping the knee straight and toes facing forward <sup>121</sup> <sup>122</sup>. Pause briefly, then bring the leg back down. Avoid leaning your torso – isolate the movement to the hip. Repeat on the other leg. This exercise works the hip abductors (glute medius/minimus) similarly to side-lying raises, but also engages core and standing leg muscles for balance <sup>138</sup> <sup>139</sup>. Strong abductors help stabilize the pelvis and knees during single-leg activities (like walking, running) <sup>140</sup> <sup>126</sup>. You can increase difficulty by adding a resistance band around the ankles or using ankle weights (if available in the future).

25. **Standing Hip Extension** (*Difficulty: Beginner*) – Reps/Sets: **10–15 repetitions** per leg, 2 sets. Stand facing a chair or wall, holding it for support. Keeping your leg straight, **extend one leg backward** (hip extension) about 10–15° while keeping your torso upright. Squeeze your glute as you lift the leg backward (the movement is relatively small) <sup>141</sup> <sup>142</sup>. Don't arch your lower back. Return the leg to the starting position and repeat, then switch legs. This exercise activates the gluteus maximus and hamstrings, enhancing hip stability and support for the knee from behind. It's essentially the standing version of the prone leg raise, engaging core and balance as well. Ensure the movement comes from the hip (you should feel your buttock working) and that the knee stays fairly straight throughout.
26. **Side-Lying Hip Adduction** (*Difficulty: Beginner*) – Reps/Sets: **10–15 repetitions** per side, 2 sets. Lie on your side on the floor, but this time work the **bottom leg**. Cross the top leg over it, placing the top foot on the floor in front of or behind your bottom knee (whatever is comfortable). Keeping the bottom leg straight, **lift the bottom leg upward** 6–8 inches off the floor <sup>143</sup> <sup>144</sup>. You will feel the inner thigh (adductors) of the bottom leg contract. Slowly lower it back down and repeat. This exercise strengthens the hip adductors (inner thigh muscles), which contribute to knee stability and alignment <sup>145</sup> <sup>146</sup>. Strong adductors also support better balance and can help prevent excessive lateral movement of the knee. As you get stronger, you can add an ankle weight or increase reps (AAOS recommends up to 3 sets of 20 for adduction) <sup>147</sup> <sup>148</sup>.
27. **Seated Leg Cross (Isometric Thigh Press)** (*Difficulty: Beginner*) – Reps/Sets: **3 repetitions** per configuration (each side), holding each for **5–10 seconds**. Sit on a sturdy surface (chair or bench) and **cross your ankles**. Push the front leg backward and back leg forward *against each other* at the same time (as if you're trying to move your legs but they lock each other in place) <sup>149</sup> <sup>150</sup>. You will feel your thigh muscles engage (quadriceps of one leg and hamstrings of the other). Hold this isometric contraction for 5+ seconds, then relax. Switch the cross (opposite ankle in front) and repeat. This exercise co-contracts the muscles around the knee without joint movement, potentially improving muscular balance and knee stability <sup>149</sup>. It's a safe way to activate thighs if dynamic movement is painful. Remember to breathe normally while pushing and avoid maximal effort – it should be a firm but controlled press.
28. **Pillow Squeeze (Isometric Hip Adduction)** (*Difficulty: Beginner*) – Reps/Sets: **10 repetitions**, holding each squeeze ~5 seconds, 2 sets. Sit on a chair or lie on your back with knees bent. Place a pillow (or a medium rubber ball) between your knees. **Squeeze your knees together**, pressing into the pillow with your inner thighs <sup>151</sup> <sup>152</sup>. Hold the squeeze for about 5 seconds, then relax. This isometric exercise specifically targets the adductors (inner thigh muscles) which help stabilize the knee medially. By strengthening these muscles, you support the knee joint and improve alignment (useful for conditions like patellar tracking issues). It's similar to the seated leg cross, but using an object can help ensure both legs engage evenly. Gradually increase the hold time or number of reps as it becomes easier.
29. **Calf Raises (Double-Leg)** (*Difficulty: Beginner*) – Reps/Sets: **10–15 repetitions**, 2–3 sets. Stand with feet hip-width apart near a wall or chair for balance. **Rise up onto the balls of your feet**, lifting

your heels as high as comfortable <sup>153</sup> <sup>154</sup>. Pause briefly at the top (you should feel your calf muscles contracting), then slowly lower your heels back to the floor. Keep your weight evenly distributed across the balls of your feet and maintain balance (use light fingertips on support if needed). Calf raises strengthen the gastrocnemius and soleus muscles in the lower leg, which support the knee by absorbing impact and contributing to proper gait <sup>155</sup> <sup>156</sup>. Aim for roughly 2 sets of 10 (AAOS suggests 2×10 daily) <sup>157</sup> <sup>158</sup>, and progress to doing them on a single leg for more challenge.

30. **Single-Leg Calf Raise** (*Difficulty: Advanced*) – Reps/Sets: **8-12 repetitions** per leg, 2 sets. Stand on one foot near a wall/chair for support, with the other foot lifted off the ground. **Raise your heel** of the standing foot, coming up onto the ball of that foot <sup>159</sup> <sup>160</sup>. Then slowly lower the heel down. Perform all reps on one side, then switch. Single-leg calf raises significantly increase the load on the calf muscles, improving lower leg strength and ankle stability. Strong calf muscles help protect the knee by contributing to shock absorption and stability during activities like walking and running <sup>161</sup> <sup>162</sup>. If it's too difficult initially, do as many reps as you can on one leg, then finish the set with both legs together. Be sure to keep a hand on a wall for safety, as balance is challenged here.
31. **Single-Leg Balance Stand** (*Difficulty: Intermediate*) – Reps/Sets: **3-4 sets of 10-30 seconds** per leg. Stand near a support, then **lift one foot** off the ground so you're balancing on the other leg <sup>163</sup> <sup>164</sup>. Keep a slight bend in the standing knee and hands on hips (or hovering near a chair for safety). Hold this single-leg stance, aiming for up to 30 seconds or as long as you can with good form <sup>165</sup> <sup>164</sup>. Then switch legs. For added challenge, try doing it **without holding on**, or on a slightly unstable surface (like a folded towel) once basic balance is good <sup>166</sup>. Balance exercises like this strengthen the small stabilizer muscles around the knee and ankle and improve proprioception <sup>167</sup> <sup>168</sup>. Better balance can translate to fewer knee injuries from missteps. If 30 seconds is easy, you can progress to gentle movements while balancing (e.g. moving your arms or closing your eyes for short intervals).
32. **Quadruped Rock-Back** (*Kneeling Knee Flexion Stretch, Difficulty: Beginner*) – Reps/Sets: **8-10 repetitions**, 2 sets. Start on hands and knees (quadruped position). Keeping your hands planted, **slowly shift your hips backward toward your heels** as far as comfortable, as if trying to sit back on your heels <sup>169</sup>. Go until you feel a gentle stretch in the knees or thighs (or until you can't go further without discomfort). Then rock forward back to the starting position. This exercise mobilizes knee flexion in a controlled, partial weight-bearing way and also stretches the quads if you can get close to your heels. It's often used in physical therapy to improve knee bending range after injury <sup>170</sup> <sup>171</sup>. Keep the motion slow and pain-free – over time, you may be able to sit back further as knee mobility increases <sup>169</sup>.
33. **Lateral Side-Step Walk** (*Difficulty: Beginner*) – Reps/Sets: **10-15 steps** each direction, 2 sets. Start in a mini-squat position (knees slightly bent, chest up). **Side-step** to the right: take a step right with your right foot, then follow with your left foot, maintaining the squat posture. Continue stepping sideways for the prescribed number of steps, then go back to the left the same way. Keep your knees bent and **don't let them collapse inward** as you move. This exercise mimics a "monster walk" without a resistance band <sup>172</sup> <sup>173</sup> – it works the outer hip and thigh muscles (glute medius, hip abductors) and trains lateral movement, which can help knee stability. It's a good warm-up or dynamic exercise for activating glutes. For increased intensity, you could later add a loop band around the thighs, but even without equipment, focusing on a deep squat and wide steps will engage the target muscles.

34. **Single-Leg Romanian Deadlift (Hip Hinge)** (*Difficulty: Advanced*) – Reps/Sets: **8-10 repetitions** per leg, 2 sets. Stand on your right leg with a **slight bend in the knee** <sup>174</sup> <sup>175</sup>. Hinge forward at the hips, extending your left leg straight behind you for counterbalance, and reach your left hand toward the floor (or your right foot) <sup>174</sup> <sup>175</sup>. Go down until you feel a stretch in the right hamstrings (or your torso is nearly parallel to the ground), then **return to standing** by engaging the right hamstrings and glutes. Keep your back flat and core tight throughout. This exercise powerfully works the hamstrings, glutes, and back muscles of the standing leg, while also challenging balance and knee stability. It's essentially a **single-leg deadlift** using bodyweight – excellent for improving the eccentric control needed for deceleration and reducing knee strain during movements <sup>176</sup> <sup>177</sup>. Start with shallow range or lightly holding onto support if needed, and increase range as you gain strength and balance.
35. **Bulgarian Split Squat (Rear-Foot Elevated Lunge)** (*Difficulty: Advanced*) – Reps/Sets: **8-12 repetitions** per leg, 2 sets. Stand a couple of feet in front of a chair or low bench. Extend your left leg back and **place the top of your left foot on the chair**. Your right foot remains on the floor a stride-length ahead. From this position, **lower into a lunge** by bending your right knee and hip, allowing your left knee to dip toward the floor <sup>178</sup> <sup>179</sup>. Keep your front knee roughly over your toes (it can go slightly past if flexibility allows, but avoid excessive forward drift if painful). Push through the right heel to rise back up. Do all reps, then switch legs (elevate right foot). This split squat variation intensely works the quads and glutes of the front leg and the hip flexors of the rear leg, improving single-leg strength and balance <sup>180</sup> <sup>181</sup>. Use a support for balance as needed. Ensure the majority of the weight is on the front leg, and the movement is straight down-up (not forward). This is a challenging exercise, so start with a lower surface if necessary and focus on form over depth.
36. **Butterfly Stretch (Seated Groin Stretch)** (*Difficulty: Beginner*) – Reps/Sets: **2 sets** of a **20-30 second hold**. Sit on the floor, put the soles of your feet together and **let your knees drop out to the sides** toward the floor <sup>182</sup> <sup>183</sup>. Keep your back straight as you gently lean forward from the hips. You may press down lightly on your thighs with your elbows to increase the stretch (but **do not force** the knees down painfully) <sup>182</sup> <sup>184</sup>. You should feel a stretch in the inner thighs (groin). The butterfly stretch opens up the hips and stretches the adductors, which can indirectly benefit the knees by improving hip mobility and reducing pull on the knee joint <sup>185</sup> <sup>186</sup>. Hold for 20+ seconds, breathing deeply. This stretch also helps with overall posture and flexibility in the hip region, which contributes to better knee alignment during activities.
37. **Standing Hamstring Stretch (Toe-Touch Stretch)** (*Difficulty: Beginner*) – Reps/Sets: **2 sets** of a **20-30 second hold**. Stand upright and place your right heel on a low stool or step (or keep both feet on the ground and simply bend forward). Keep the right leg *nearly straight* (a slight knee bend is okay) and **hinge forward at the hips**, reaching toward your toes until you feel a stretch along the back of the right thigh. Keep your back flat as long as possible (you can round gently at the end range). Hold ~20 seconds <sup>187</sup> <sup>14</sup>, then switch legs. If balancing on one leg is an issue, do this near a wall for support or perform a two-legged standing hamstring stretch by bending toward your toes (with both knees slightly soft). Adequate hamstring flexibility can alleviate undue pressure on the knees by allowing normal hip motion. Don't "bounce" – hold the stretch and breathe. If a stool is used, ensure it's not too high; the stretch should be mild, not painful.
38. **Forward Leg Swings (Dynamic Hip Swing)** (*Difficulty: Beginner*) – Reps/Sets: **10 swings** per leg (forward/back), 2 sets. Stand next to a wall or hold a sturdy object for balance. Shift weight to your left leg. **Swing your right leg forward and backward** in a controlled pendulum motion <sup>188</sup> <sup>189</sup>. Swing forward to about waist height (or until you feel a stretch in your hamstrings),

and backward to a comfortable point (feeling a stretch in the front of the hip). Perform 10 swings, gradually increasing range as it loosens up, then switch to swing the left leg. Forward leg swings dynamically stretch the hamstrings and hip flexors and increase blood flow to the knee joint as the leg moves through extension and flexion. They are often used in warm-ups to prepare the knees and hips for activity. Keep the swings smooth and controlled – this is not a kick, but a swing, so avoid any jerky motion.

39. **Lateral Leg Swings (Side-to-Side Swings)** (*Difficulty: Beginner*) – *Reps/Sets: 10 swings* per leg (side-to-side), 2 sets. Stand facing a support (like the back of a chair) and shift weight to your left leg. **Swing your right leg across your body** to the left (in front of your left leg), then out to the right side <sup>188</sup> <sup>189</sup>. The motion is like a metronome – crossing midline and then abducting. Keep your torso stable and let the leg swing freely from the hip. Do 10 swings, then switch legs. Lateral leg swings dynamically loosen the inner and outer thigh muscles (adductors and abductors) and improve hip mobility in the frontal plane. They also gently mobilize the knee and ankle as the leg moves. Use this exercise to warm up the hip and knee joints with fluid motion. As with forward swings, start with small range and increase as it feels comfortable, maintaining control throughout.

40. **Tibialis Raises (Toe Raises at Wall)** (*Difficulty: Beginner*) – *Reps/Sets: 15–25 repetitions*, 2 sets. Stand with your back against a wall, feet about 12–18 inches away from the wall, legs straight. **Flex your ankles** to lift your toes and forefeet off the ground, keeping your heels planted <sup>190</sup> <sup>191</sup>. Essentially, rock back on your heels so the muscles along the front of your shin (tibialis anterior) contract to pull the toes upward. Then lower the toes back down to the floor. Repeat for high reps (you should feel a burn along the shins by ~15+ reps <sup>192</sup> <sup>193</sup>). Tibialis anterior strength is often overlooked but is important for decelerating the foot and reducing impact on the knees when walking or running <sup>194</sup> <sup>195</sup>. Strong tibialis muscles can **absorb force** and take load off the knee joints <sup>195</sup> <sup>196</sup>. As you get stronger, you can make it harder by stepping further from the wall (increasing the angle) or eventually doing this exercise on one leg. Aim for about 20–25 reps; if you fatigue around 15, that's normal – try to build up to the higher reps over time <sup>192</sup> <sup>193</sup>.

**Sources:** These exercises and guidelines are drawn from orthopedic and physical therapy resources, including the AAOS Knee Conditioning Program <sup>197</sup> <sup>198</sup>, arthritis foundations <sup>199</sup> <sup>200</sup>, and expert-reviewed fitness articles <sup>201</sup> <sup>65</sup>. Always perform exercises with good form and within a pain-free range. Consistency is key – doing these movements regularly (e.g. daily or 4–5 times a week) can help build strength and flexibility around the knee <sup>202</sup> <sup>203</sup>. If an exercise exacerbates pain, skip it or modify it, and consider consulting a physical therapist for personalized modifications <sup>1</sup> <sup>2</sup>. With time and proper progression, these exercises can improve knee stability, reduce pain, and enhance overall lower-limb function <sup>204</sup> <sup>205</sup>.

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1 2 3 4 8 10 11 12 51 52 55 56 59 60 65 66 67 68 101 102 103 116 117 118 119 120 129 130

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