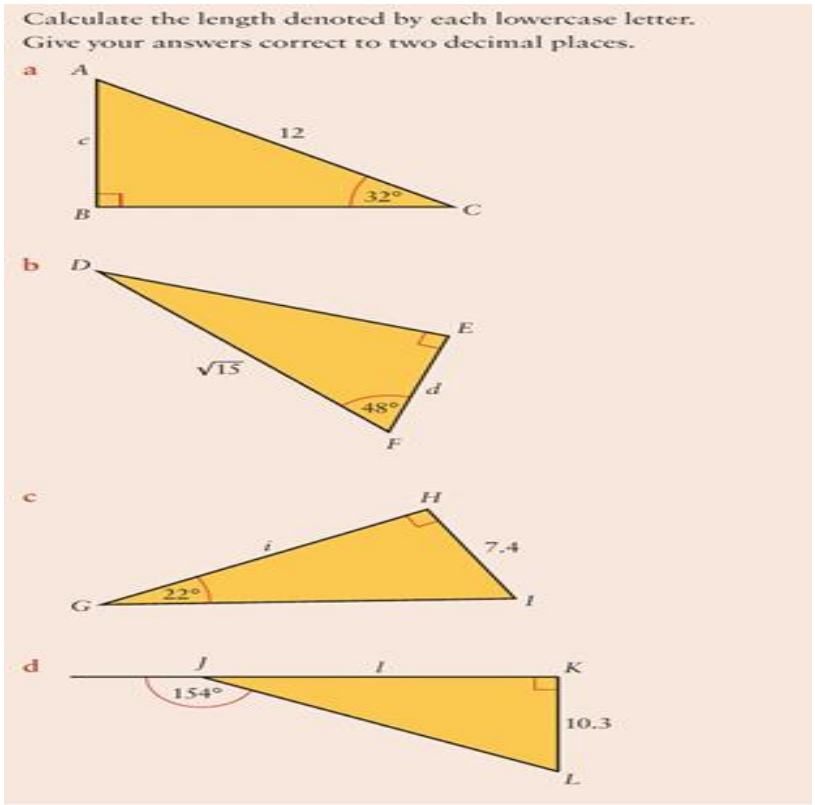
Practice Questions for Extended Mathematics

Question 1

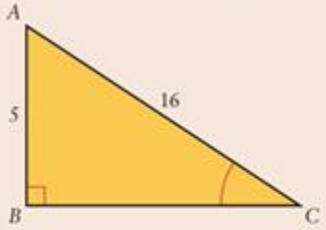
1. a) $x^2 - 16x + 61 = 2x - 20$
   b) $2x^2 - 16x = -x^2 + 12$
2. a) $x^2 - 10x + 21 = 3x - 5$
   b) $3x^2 - 9x = -x^2 + 4$
3. a) $x^2 - 8x + 12 = 2x - 6$
   b) $4x^2 - 20x = -2x^2 + 8$
4. a) $x^2 - 14x + 45 = 4x - 9$
   b) $5x^2 - 15x = -3x^2 + 6$
5. a) $x^2 - 12x + 35 = x - 7$
   b) $6x^2 - 30x = -2x^2 + 10$

Question 2

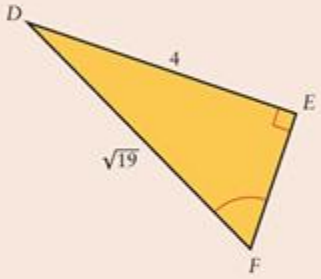


Calculate the value of each marked angle using the appropriate trigonometric ratio. Give your answer correct to one decimal place.

a



b



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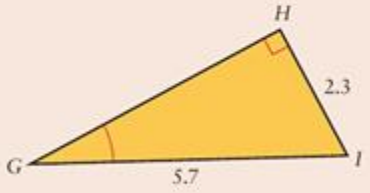
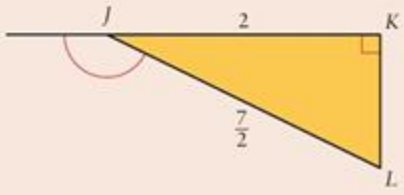


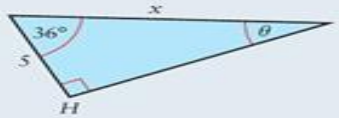
d



Question 3

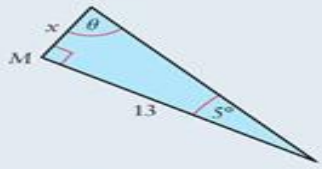
Find the values of x and θ. Give your answers for x correct to three decimal places.

a



b

c



d

Question 4

1. It is given that $f(x) = 9x^2 + qx + 4 = 0$, where q is a nonzero constant. The quadratic equation has equal roots. Find the value of the variable.
2. It is given that $f(x) = rx^2 - 12x + 3 = 0$, where r is a nonzero constant. The quadratic equation has equal roots. Find the value of the variable.
3. It is given that $f(x) = 16x^2 + 16x + s = 0$, where s is a nonzero constant. The quadratic equation has equal roots. Find the value of the variable.
4. It is given that $f(x) = 25x^2 - 30x + t = 0$, where t is a nonzero constant. The quadratic equation has equal roots. Find the value of the variable.
5. It is given that $f(x) = 7x^2 + ux + 2 = 0$, where u is a nonzero constant. The quadratic equation has equal roots. Find the value of the variable.
6. It is given that $f(x) = 4x^2 + vx + 9 = 0$, where v is a nonzero constant. The quadratic equation has equal roots. Find the value of the variable.
7. It is given that $f(x) = ax^2 - 8x + 1 = 0$, where a is a nonzero constant. The quadratic equation has equal roots. Find the value of the variable.
8. It is given that $f(x) = 36x^2 + wx + 16 = 0$, where w is a nonzero constant. The quadratic equation has equal roots. Find the value of the variable.

Question 5

For each:

a) Express the quadratic in the form $(x+a)^2 = b$ with integers a, b(use completing of squares)

b) Solve for x using the square-root property.

c) State the axis of symmetry.

1. $x^2 + 6x - 7 = 0$
2. $x^2 + 2x - 8 = 0$
3. $x^2 - 4x - 5 = 0$
4. $x^2 + 10x + 21 = 0$
5. $x^2 - 6x + 5 = 0$
6. $x^2 + 8x - 20 = 0$
7. $x^2 - 2x - 15 = 0$
8. $x^2 + 12x + 32 = 0$
9. $x^2 - 10x + 24 = 0$
10. $x^2 + 4x - 12 = 0$

Question 6

For each parabola, do parts (a)–(d):
a) Find the y-intercept.
b) Find the x-intercepts.
c) From (b) find the equation of the axis of symmetry and the coordinates of the vertex.
d) Sketch by hand the graph (use an appropriate scale).

1. $y = x^2 - 6x + 5$
2. $y = x^2 + 4x - 12$
3. $y = x^2 - 8x + 12$
4. $y = x^2 + 2x - 3$
5. $y = x^2 - 10x + 21$
6. $y = x^2 + 6x + 8$
7. $y = x^2 - 4x - 5$
8. $y = x^2 + 8x + 16$
9. $y = x^2 - 2x - 15$
10. $y = x^2 + 10x + 21$

Question 7

1. A building is 80 m high. From a point on level ground the angle of elevation to the top is 18°.
   a) Find the distance from the point to the base.
   b) If the observer moves 20 m toward the building, find the new angle of elevation.
2. A tower is 60 m high. From a point on level ground the angle of elevation is 25°.
   a) Find the horizontal distance to the base.
   b) How far must the observer move toward the tower so the angle becomes 45°?
3. A lighthouse is 12 m tall. From a point on level ground the angle of elevation is 30°.
   a) Find the distance from the point to the base.
   b) If the observer moves 4 m toward the lighthouse, find the new angle of elevation.
4. A chimney is 45 m tall. From a point on level ground the angle of elevation to its top is 20°.
   a) Find the horizontal distance to the base.
   b) How far must you move so the angle becomes 38°?
5. A skyscraper is 150 m tall. From a point on level ground the angle of elevation is 15°.
   a) Find the distance from the point to the base.
   b) If the observer moves 50 m toward the skyscraper, find the new angle of elevation.
6. A water tower is 35 m high. From a point on level ground the angle of elevation is 28°.
   a) Find the horizontal distance to the base.
   b) How far must the point move toward the tower for the angle to be 50°?

Question 8

1. An aircraft departs Town A on a 060° course for 210 km to B, then on a 150° course for 340 km to C. Find (a) distance AC and (b) bearing of C from A.
2. A plane leaves A on a 120° course for 290 km to B, then on a 210° course for 180 km to C. Find AC and the bearing of C from A.
3. From A fly on a 330° course for 400 km to B, then on a 075° course for 220 km to C. Find AC and bearing of C from A.
4. Depart A on a 200° course for 150 km to B, then on a 270° course for 300 km to C. Find AC and bearing of C from A.
5. Leave A on a 045° course for 360 km to B, then on a 225° course for 240 km to C. Find AC and bearing of C from A.
6. Fly from A on a 143° course for 280 km to B, then on a 317° course for 190 km to C. Find AC and bearing of C from A.
7. From A fly on a 185° course for 500 km to B, then on a 320° course for 260 km to C. Find AC and bearing of C from A.