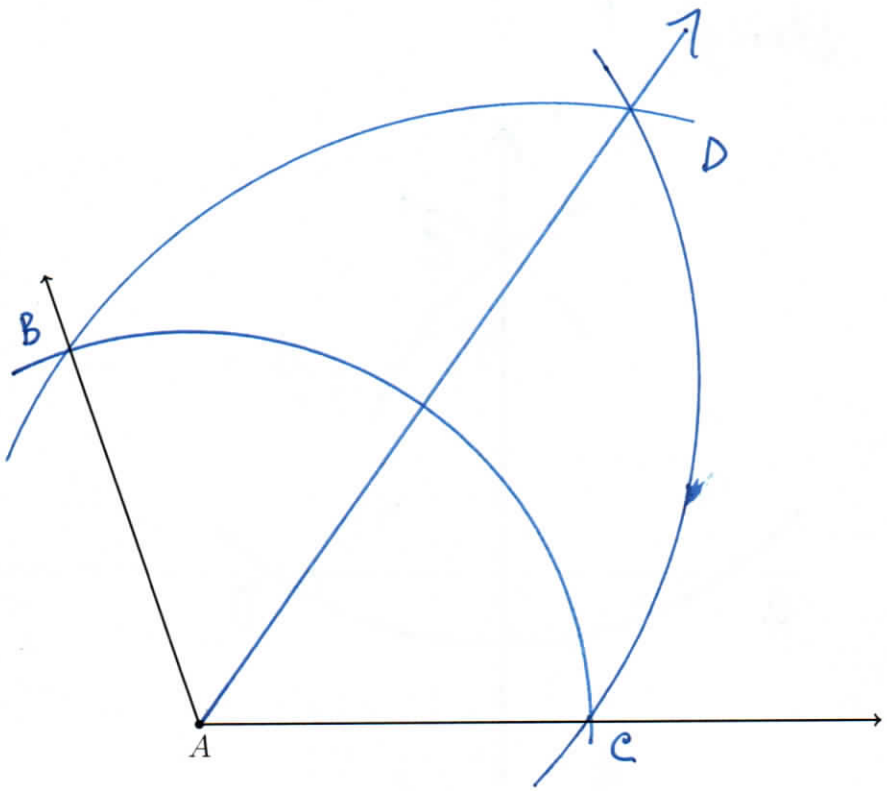
Name: Solutions

Pre-test problem set: Exam Friday

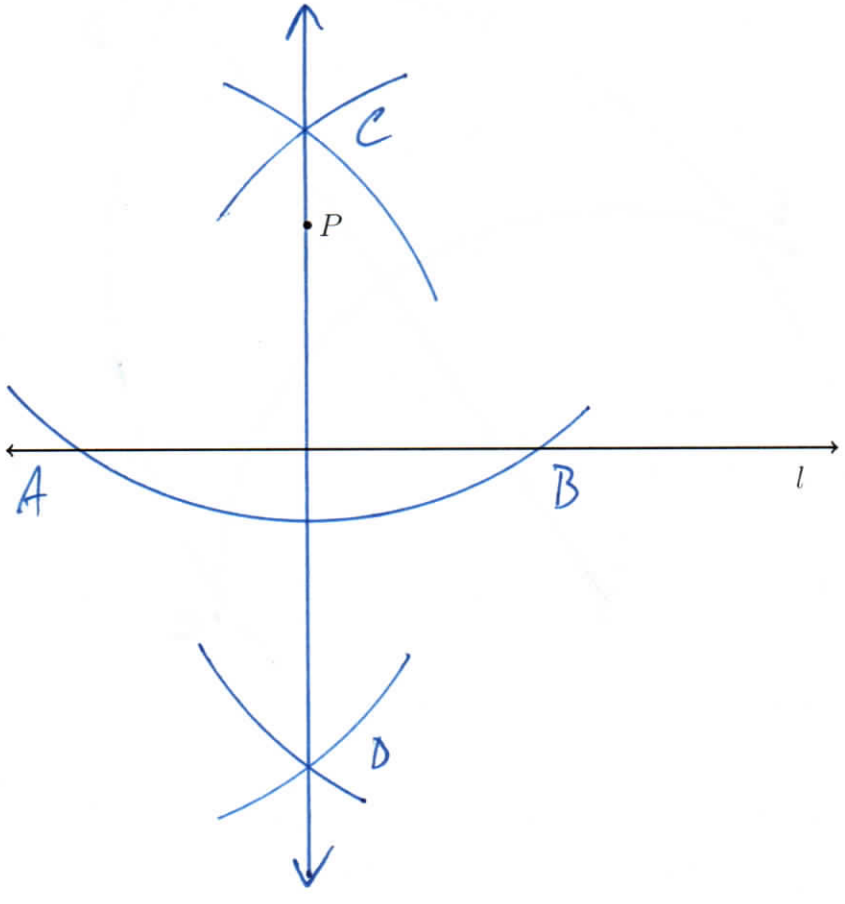
1. Complete the construction of an angle bisector including the six steps.
   (a) Given an angle with vertex A.
   (b) Construct circle A with arbitrary radius (i.e. the radius does not matter).
   (c) Label the intersections B and C of the angle's rays and circle A.
   (d) Construct circle B with radius BC.
   (e) Construct circle C with radius BC.
   (f) Label D, the intersection of circle B and C.
   (g) Draw ray $\overrightarrow{AD}$.
   (h) Ray $\overrightarrow{AD}$ bisects $\angle A$.



2. Construction a perpendicular to a line through a given point.
   Spicy: List the steps

   Given the line l and point P.

Circle P of sufficient radius to make
Intersection points A, B
Circles A, B with equal radii
Intersections of circles, C & D
$\overleftrightarrow{CD}$ is perpendicular to l through P



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3. Points that are all located on the same plane are Coplanar.

4. Given the conditional statement, "If a quadrilateral has congruent diagonals, then it is a rectangle."

   (a) Write down the hypothesis.

   A quadrilateral has Congruent diagonals

   (b) Write down the converse of the statement.

   If a quadrilateral is a rectangle, then it has Congruent diagonals

   (c) Write down the negation of the conclusion of the statement.

   It is not a rectangle

5. Given $A(2,4)$ and $B(6,9)$, find the coordinates of the midpoint of $\overline{AB}$, the point M.

$$M = \left(\frac{2+6}{2}, \frac{4+9}{2}\right)$$

$$= \left(4, \frac{13}{2}\right)$$

6. Given $m\angle A = 65$, $m\angle B = 42$, $m\angle 1 = 50$, $m\angle DEF = 132$, $m\angle FEG = 48$.

   (a) Find a pair of complementary angles. $\angle B$ $\angle FEG$

   (b) Find a pair of supplementary angles. $\angle DEF$ $\angle FEG$

7. Find the value of $|\pi - \frac{2}{5}| + \pi$.

$$= \pi - \frac{2}{5} \quad +\pi$$

$$= 2\pi - \frac{2}{5}$$

$$= 5.88318\ldots \approx 5.88$$

extra

8. Given $R(-3,4)$ and $S(3,12)$, find the length of $\overline{RS}$.

$$RS = \sqrt{(3-(-3))^2 + (12-4)^2}$$
$$= \sqrt{6^2 + 8^2}$$
$$= \sqrt{100} = 10$$

9. In a proof, each of the following statements are written. Write down the reason that would justify each step.

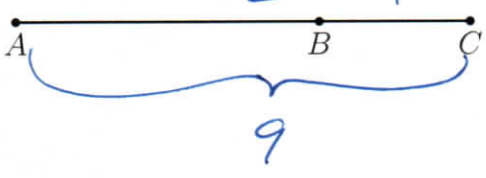
(a) $\overline{BC} \cong \overline{BC}$ — Reflexive property

(b) $XY + BC = YZ + BC$ — Addition property (of equality)

(c) $2(XY + YZ) = 2XY + 2YZ$ — Distributive property

10. Given $\overline{ABC}$, $AC = 9$, and the point B partitions $\overline{AC}$ in a ratio of 2:1.

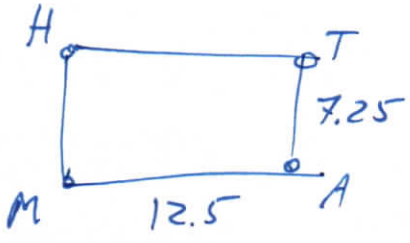
Find AB.



$$AB = \frac{2}{3} AC = 6$$
$$BC = \frac{1}{3} AC = 3$$

check $6 + 3 = 9$ & $6 = 2 \cdot 3$

11. Given rectangle $MATH$ with $MA = 12.5$ and $AT = 7.25$.



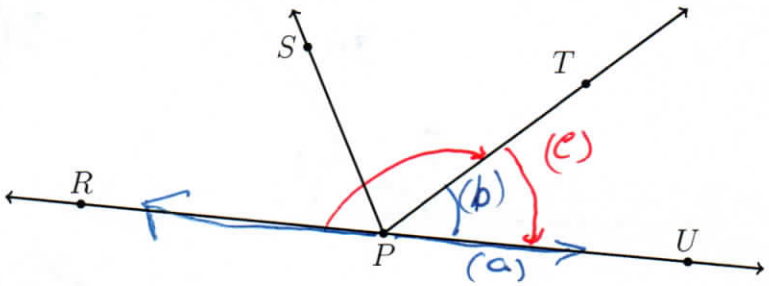
(a) Find the perimeter of $MATH$.

$$P = 2l + 2w = 2(12.5) + 2(7.25)$$
$$= 39.5$$

(b) Find the area of $MATH$.

$$A = l \cdot w = 12.5 \times 7.25$$
$$= 90.625$$

12. Given the situation in the diagram, answer each question. Circle True or False.



(a) True or False: $\overrightarrow{PR}$ and $\overrightarrow{PU}$ are opposite rays.

(b) True or False: $\angle TPU$ is an acute angle.

(c) True or False: $\angle RPT$ and $\angle TPU$ are complementary angles. (Supplementary)

(d) True or False: $\angle RPT$ and $\angle UPT$ are adjacent.

13. Given the circle C with area 64π. Find the circumference of C.

$A = \pi r^2$

$64\pi = \pi r^2$

$64 = r^2$

$8 = r$

$C = 2\pi r$

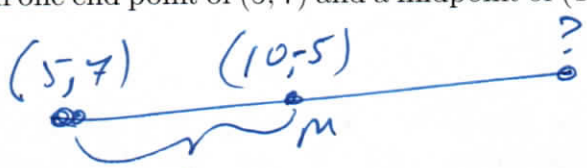
$= 2\pi(8)$

$= 16\pi$

$= 50.26548\ldots \approx 50.3$ extra

14. Find the length of a line segment with one end point of $(5, 7)$ and a midpoint of $(10, -5)$.

(half)



ℓ

$\ell = \sqrt{(10-5)^2 + (-5-7)^2}$

$= \sqrt{5^2 + (-12)^2}$

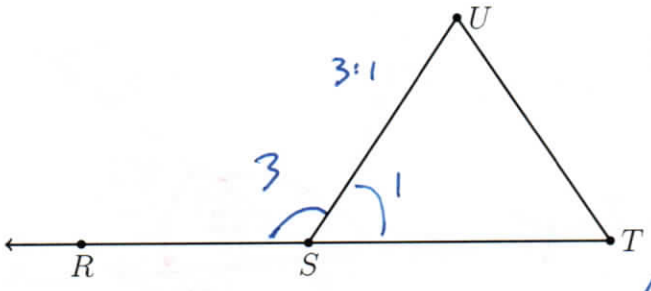
$= \sqrt{169} = 13$

whole line segment

$= 2 \times 13$

$= 26$

15. Given $m\angle RSU$ is three times $m\angle TSU$. Find $m\angle TSU$.



Linear pair

$m\angle RSU + m\angle TSU = 180$

$3(m\angle TSU) + m\angle TSU = 180$

$4(m\angle TSU) = 180$

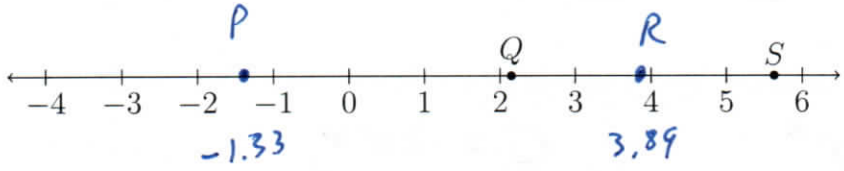
$m\angle TSU = 45$

check

$m\angle RSU = 3(45) = 135$

$45 + 135 = 180$ ✓

16. Given $\overleftrightarrow{QS}$ as shown on the number line, with Q having the coordinate 2.15 and S the coordinate 5.63.



(a) Find the value of the coordinate of the point R, the midpoint of $\overline{QS}$.

$R = \dfrac{2.15 + 5.63}{2} = 3.89$

(b) The point P is collinear with $\overleftrightarrow{QS}$ such that Q is the midpoint of $\overleftrightarrow{PS}$. Mark P on the line and state the value of its coordinate.

midpoint:

$Q = \dfrac{P + S}{2}$

$2.15 = \dfrac{P + 5.63}{2}$

$\times 2$

$4.3 = P + 5.63$

-5.63

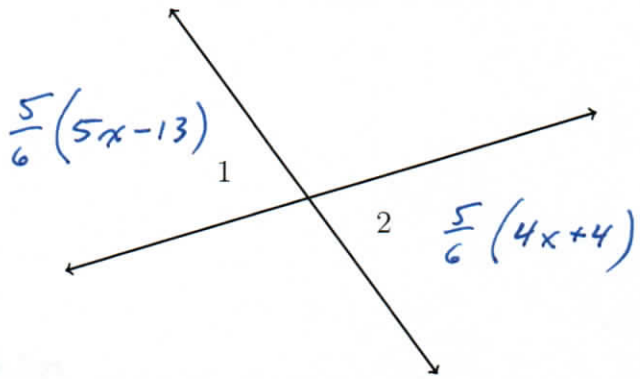
$P = 4.3 - 5.63 = -1.33$

check

$\dfrac{-1.33 + 5.63}{2} = 2.15$ ✓

17. Given two vertical angles, $m\angle 1 = \frac{5}{6}(5x - 13)$, $m\angle 2 = \frac{5}{6}(4x + 4)$. Find $m\angle 1$.

(a) First label the drawing.



(b) Write a geometric equation: $m\angle 1 = m\angle 2$ State the reason: Vertical angles have equal measures

(c) Substitute algebraic values: $\frac{5}{6}(5x-13) = \frac{5}{6}(4x+4)$

(d) Solve for x

$5x - 13 = 4x + 4$

$x = 17$

(e) Answer the question:

$m\angle 1 = \frac{5}{6}(5(17) - 13)$

$= \frac{5}{6}(72) = 60$

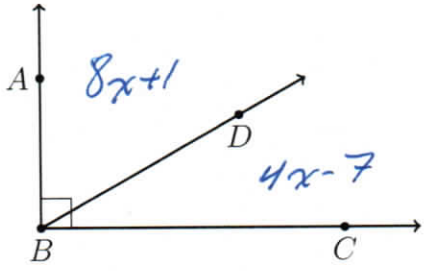
(f) Check your answer

$m\angle 2 = \frac{5}{6}(4(17) + 4)$

$= \frac{5}{6}(72) = 60$ ✓

18. Given $\overrightarrow{BA} \perp \overrightarrow{BC}$, $m\angle ABD = 8x + 1$, and $m\angle DBC = 4x - 7$. Find $m\angle DBC$.

First label the drawing.



(a) Write a geometric equation: $m\angle ABD + m\angle DBC = 90$ perpendicular rays as legs

(b) Substitute algebraic values: $(8x+1) + (4x-7) = 90$

(c) Solve for x

$12x - 6 = 90$
$12x = 96$
$x = 8$

(d) Answer the question:

$m\angle DBC = 4(8) - 7$
$= 25$

(e) Check your answer

$m\angle ABD = 8(8) + 1$
$= 65$

$25 + 65 \stackrel{\checkmark}{=} 90$

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Classwork: Construction review

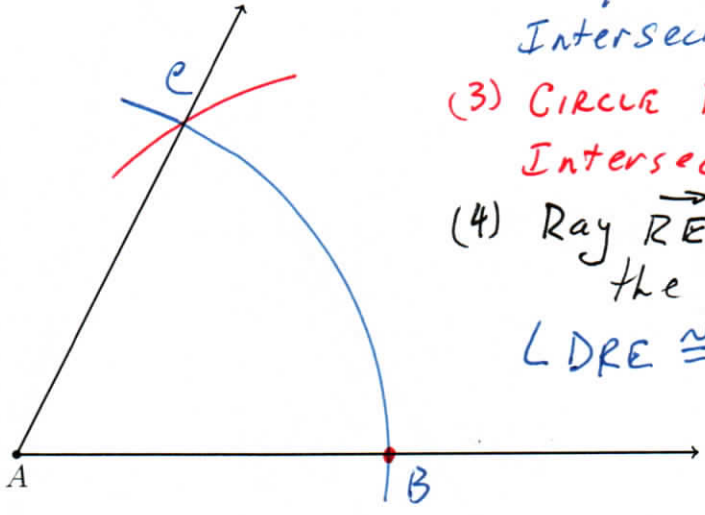
Use only a compass and straightedge for these classical constructions.

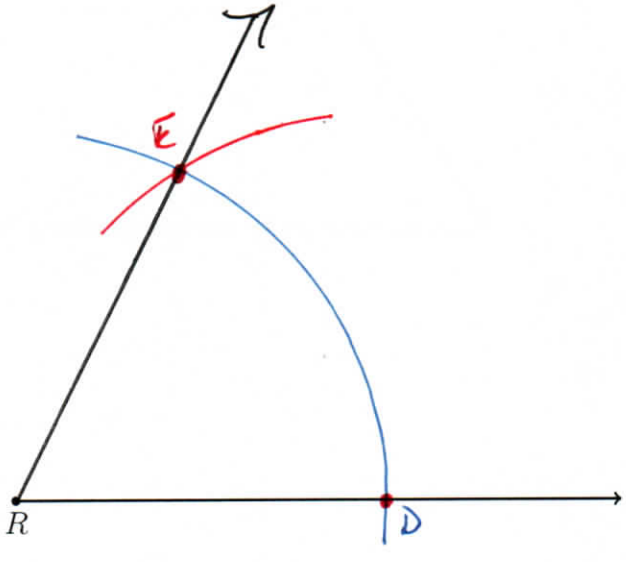
1. Duplicate a given angle.

   Construct an angle with vertex R and one leg the ray $\overrightarrow{R}$, congruent to $\angle A$. Show all construction marks.

   Spicy: List the steps

(1) Given $\angle A$, Ray $\overrightarrow{R}$
(2) Circles A and R with equal radii
Intersects B, C, D
(3) Circle D, radius BC
Intersects E
(4) Ray $\overrightarrow{RE}$ completes the angle
$\angle DRE \cong \angle BAC$





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2. Spicy: Construct the perpendicular bisectors of the legs of a triangle and, hence, the circumcenter.