AMDG

NAME | Ms. Kresovic

Adv Geo -- | ***Ch 9 Review*** | Thursday, 20 March 2014

ANSWER KEY

Pages 429 – 433 Chapter 9 Review Problems

1 **a** $\frac{HG}{EG} = \frac{EG}{FG}$

$\frac{4}{6} = \frac{6}{x}$

$4x = 36$

$x = 9$

b $\frac{GH}{EH} = \frac{EH}{HF}$

$\frac{4}{x} = \frac{x}{16}$

$x^2 = 64$

$x = 8$

c $\frac{GF}{EF} = \frac{EF}{FH}$

$\frac{4}{2\sqrt{5}} = \frac{2\sqrt{5}}{x}$

$4x = 20$

$x = 5$

d $EH^2 + EF^2 = HF^2$

$2^2 + 3^2 = HF^2$

$13 = HF^2$

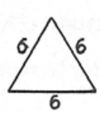
$\sqrt{13} = HF$

2 **a** 30°60°90° **b** 3-4-5 **c** 5-12-13 **d** 8-15-17 **e** 45°45°90°

3 **a** 30 (8-15-17 family) **b** 5, $5\sqrt{3}$ (30°60°90°△ **c** 7 (7, 24, 25 family) **d** 15 (3-4-5 family) **e** $4\sqrt{5}$ (3, 4, 5 family) **f** 9 (9-40-41 family) **g** $5\sqrt{3}$, $10\sqrt{3}$ (30°60°90° △) **h** $\frac{25}{2}$ (7-24-25 family) **i** 26 (5-12-13 family) **j** $4\sqrt{2}$, $4\sqrt{2}$ (45°45°90°△)

4 $6^2 + 8^2 = AB^2$, $100 = AB^2$, $AB = 10$, perimeter = 40

5 The △ shown is equilateral so each ∠ is 60°. The alt forms a 30°60°90° △ and is opp the 60° ∠. (The side opp the 60° ∠ is $\sqrt{3}$ times the shorter leg.) Shorter leg is 3. Alt is $3\sqrt{3}$.



6 $3^2 + 4^2 = d^2$

$9 + 16 = d^2$

$25 = d^2$

$d = 5$ km

7 $24^2 + x^2 = 25^2$

$576 + x^2 = 625$

$x^2 = 49$

$x = \sqrt{49} = 7$

The foot of the ladder is 7 feet from the wall.

8 The altitude to the base of an isos △ bis the base and forms 2 rt △s.

So $8^2 = 3^2 + (\text{alt})^2$

$64 = 9 + (\text{alt})^2$

$\sqrt{64 - 9} = \text{alt}$

$\sqrt{55} = \text{alt}$

$7.4 \approx \text{alt}$

9 If the alt of the equilateral △ is $8\sqrt{3}$, the shorter leg is 8 and the hyp (side) is 16. The perimeter is 48.

10 $2^2 + 5^2 = \text{diagonal}^2$

$4 + 25 = \text{diagonal}^2$

$29 = \text{diagonal}^2$

$\sqrt{29} = \text{diagonal}$

11 Draw alt $\overline{RZ}$.

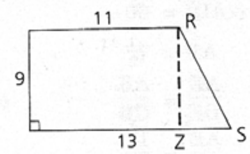
$RZ = 9$, $ZS = 2$.

$(RS)^2 = (ZS)^2 + (RZ)^2$

$(RS)^2 = 2^2 + 9^2$

$RS = 4 + 81$

$RS = \sqrt{85}$



12 The side opp the 60° ∠ is $\sqrt{3}$ times the shorter leg. VZ = 2

$2 = (\sqrt{3})(TZ)$

$\frac{2}{\sqrt{3}} = TZ$

$\frac{2\sqrt{3}}{3} = TZ$

In a 30°60°90° △, the hypotenuse is (2)(shorter leg).

$TV = 2\left(\frac{2\sqrt{3}}{3}\right)$

$TV = \frac{4\sqrt{3}}{3}$

13 Find HC.

$(HC)^2 = (HB)^2 + (BC)^2$

$(HC)^2 = 3^2 + 12^2$

$(HC)^2 = 9 + 144$

$HC = \sqrt{153}$

$HC = 3\sqrt{17}$

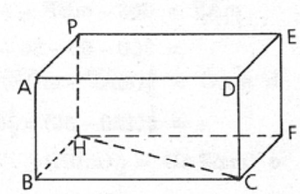
Find PC, the diagonal.

$(PC)^2 = (PH)^2 + (HC)^2$

$(PC)^2 = 4^2 + (3\sqrt{17})^2$

$(PC)^2 = 16 + 9(17)$

$PC = \sqrt{16 + 153} = \sqrt{169} = 13$



14 If $\overline{PR} = 20$ and $\overline{PS} = 25$, then draw $\overline{RS}$ and

$$20^2 + RS^2 = 25^2$$
$$400 + RS^2 = 625$$
$$RS^2 = 225$$
$$RS = \sqrt{225} = 15$$

$RS = \frac{1}{2}MK$ so $MK = 30$ Perimeter $= 4(30) = 120$

15 In $\triangle HEG$, draw $\overline{EG}$.

$$(EG)^2 = (HE)^2 + (HG)^2$$
$$(EG)^2 = 4^2 + 12^2$$
$$EG = \sqrt{16 + 144}$$
$$EG = \sqrt{160} = 4\sqrt{10}$$

In $\triangle AEG$,

$$(AG)^2 = (AE)^2 + (EG)^2$$
$$(AG)^2 = 7^2 + (4\sqrt{10})^2$$
$$(AG)^2 = 49 + 160$$
$$AG = \sqrt{209} \approx 14.5$$

16 a $\triangle ABC$ is a member of the 8-15-17 family, so CB = 8.

b
$$\frac{AD}{DE} = \frac{AC}{CB}$$
$$\frac{AD}{4} = \frac{15}{8}$$
$$8(AD) = 60$$
$$AD = 7\tfrac{1}{2}$$

c
$$\frac{AE}{DE} = \frac{AB}{CB}$$
$$\frac{AE}{4} = \frac{17}{8}$$
$$8(AE) = 68$$
$$AE = 8\tfrac{1}{2}$$

d
$$AB - AE = EB$$
$$17 - 8\tfrac{1}{2} = EB$$
$$8\tfrac{1}{2} = EB$$

e
$$AC - AD = DC$$
$$15 - 7\tfrac{1}{2} = DC$$
$$7\tfrac{1}{2} = DC$$

17
$$AB = \sqrt{(4-1)^2 + (15-11)^2}$$
$$= \sqrt{3^2 + 4^2}$$
$$= \sqrt{25} = 5$$

18 $m\angle M = \frac{1}{2}(90 - 40) = \frac{1}{2}(50) = 25$

19 a
$$m\widehat{AD} = 180 - m\widehat{BE} - m\widehat{DE}$$
$$= 180 - 30 - 80 = 70$$
$$m\widehat{AF} = 360 - m\widehat{BF} - m\widehat{BE} - m\widehat{DE} - m\widehat{AD}$$
$$= 360 - 60 - 80 - 30 - 70 = 120$$

b
$$m\angle C = \tfrac{1}{2}(m\widehat{AF} - m\widehat{DE})$$
$$= \tfrac{1}{2}(120 - 30) = \tfrac{1}{2}(90) = 45$$

c
$$m\angle BAD = \tfrac{1}{2}(m\widehat{BD})$$
$$= \tfrac{1}{2}(110)^\circ = 55^\circ$$

20 a $m\widehat{RTC} = 2m\angle REC = 2(90) = 180$

b $\ell\ \widehat{RTC} = \frac{180}{360}(10\pi) = 5\pi$

c $A_c = \pi(5)^2 = 25\pi \approx 78.5$

$A_R = 8 \cdot 6 = 48$

$A_C - A_R \approx 78.5 - 48 \approx 30.5$

21 a $m\angle DEF = \frac{1}{2}(m\widehat{DF}) = \frac{1}{2}(180) = 90$

b $m\widehat{DEF} = 180$

c $r = 10$

$\ell\ \widehat{DEF} = \frac{180}{360}(20\pi) = 10\pi$

22 a $m\widehat{BC} = 2(m\angle CAB) = 2(30) = 60$

b $m\widehat{AC} = 180 - m\widehat{BC} = 180 - 60 = 120$

c $\ell\ \widehat{BC} = \frac{60}{360}(12\pi) = 2\pi \approx 6.28$

d $A = \frac{60}{360}(\pi(6)^2) = 6\pi \approx 18.85$

23 The boats traveled for 3 hours each, so Boat A traveled 60 km, Boat B 45 km. 60 = (15)(4), 45 = (15)(3) and the distance between is the hypotenuse of a rt $\triangle$ in the 3-4-5 family. The hypotenuse is (5)(15) or 75 km.

24 a
$$\frac{8}{10} = \frac{10}{8 + x}$$
$$100 = 64 + 8x$$
$$36 = 8x$$
$$4\tfrac{1}{2} = x$$

b
$$\frac{y}{6} = \frac{6}{y + 9}$$
$$36 = y^2 + 9y$$
$$y^2 + 9y - 36 = 0$$
$$(y + 12)(y - 3) = 0$$
$$y = -12 \text{ or } y = 3$$

Length cannot be negative.

$y = 3$

25 To swim directly:

$$1^2 + 3^2 = x^2$$
$$1 + 9 = x^2$$
$$\sqrt{10} = x$$

$\sqrt{10}$ miles at 2 mph would be $\frac{\sqrt{10}}{2}$ or approximately $1\frac{1}{2}$ hrs.

To swim across and walk:

1 m swimming at 2 mph = $\frac{1}{2}$ hr.

3 m walking at 4 mph = $\frac{3}{4}$ hr. So $\frac{1}{2} + \frac{3}{4} = 1\frac{1}{4}$ hr.

It is quicker to swim across and then walk.

26 Assume that the dock is $\perp$ to the water. Two rt $\triangle$s are formed.

$$15^2 + y^2 = 25^2$$
$$225 + y^2 = 625$$
$$y^2 = 400$$
$$y = 20$$

$$15^2 + z^2 = 17^2$$
$$225 + z^2 = 289$$
$$z^2 = 64$$
$$z = 8$$

$$y - z = x$$
$$20 - 8 = x$$
$$12 = x$$

27 (5, 12, 13) is a Pythagorean triple, so z = 5. (3, 4, 5) is a Pytharogean triple, so y = 4. $8\frac{1}{2} = \frac{17}{2}$, $4 = \frac{8}{2}$ and (8, 15, 17) is a Pythagorean triple, so $x = \frac{15}{2}$ or 7.5.

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28 The final distances are 24 paces east and 45 paces north. Use the Pythagorean Theorem to find the distance (hypotenuse).

$$45^2 + 24^2 = x^2$$
$$2025 + 576 = x^2$$
$$2601 = x^2$$
$$51 = x$$

29 In a kite, one diagonal is the ⊥ bis of the other. So $\overline{KT} \perp$ bis $\overline{IE}$ making $\overline{IP}$ the alt of △KIT and $\overline{IP} \cong \overline{PE}$. △KIT is rt △ because ∠KIT is a rt ∠.

a $\frac{PT}{IP} = \frac{IP}{PK}$ Alt to hyp is mean propor between seg of hyp.

$$\frac{4}{IP} = \frac{IP}{9}$$
$$IP^2 = 36$$
$$IP = 6$$
$$IE = 12$$

b To find $\overline{IK}$ and $\overline{IT}$, use Pythagorean Theorem.

$IK^2 = KP^2 + IP^2$	$IT^2 = PT^2 + IP^2$
$IK^2 = 9^2 + 6^2$	$IT^2 = 4^2 + 6^2$
$IK^2 = 81 + 36$	$IT^2 = 16 + 36$
$IK^2 = 117$	$IT^2 = 52$
$IK = \sqrt{117}$	$IT = \sqrt{52}$
$IK = 3\sqrt{13}$	$IT = 2\sqrt{13}$

In kite, 2 distinct pairs of consecutive sides ≅. $\overline{KI} \cong \overline{KE}$ and $\overline{IT} \cong \overline{ET}$. Perimeter is $2(3\sqrt{13}) + 2(2\sqrt{13}) = 10\sqrt{13}$.

30 **a** E (9, −3) **b** RE = 14, CE = 5, A = 14 · 5 = 70

c $RC = \sqrt{(9-(-5))^2 + (2-(-3))^2}$
$= \sqrt{14^2 + 5^2}$
$= \sqrt{221} \approx 14.9$

31 slope $\overline{QU} = \frac{11-(-4)}{4-(-1)} = 3$

slope $\overline{AD} = \frac{-3-12}{-4-1} = 3$

$\therefore \overline{QU} \parallel \overline{AD}$

slope $\overline{AU} = \frac{11-12}{4-1} = -\frac{1}{3}$

slope $\overline{QD} = \frac{-4-(-3)}{-1-(-4)} = -\frac{1}{3}$

$\therefore \overline{AU} \parallel \overline{QD}$.

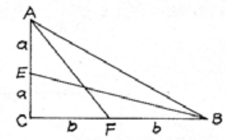
2 prs of opp sides ∥, so QUAD is ▱.

$DU = \sqrt{(4-(-4))^2 + (11-(-3))^2}$
$= \sqrt{8^2 + 14^2} = \sqrt{260}$

$QA = \sqrt{(-1-1)^2 + (-4-12)^2}$
$= \sqrt{(-2)^2 + (-16)^2} = \sqrt{260}$

QA = DU, so diagonals are ≅. ∴ QUAD is a ▭.

32



In △ACF,	In △ECB,
$(2a)^2 + b^2 = (\sqrt{41})^2$	$(2b)^2 + a^2 = (2\sqrt{26})^2$
$4a^2 + b^2 = 41$	$4b^2 + a^2 = 104$

Solve simultaneous equations.

$$4a^2 + b^2 = 41$$
$$a^2 + 4b^2 = 104$$

Mult −4, $-16a^2 - 4b^2 = -164$ $\qquad a^2 + 4b^2 = 104$

$a^2 + 4b^2 = 104$ $\qquad (2)^2 + 4b^2 = 104$

$-15a^2 = -160$ $\qquad 4b^2 = 100$

$a^2 = 4$ $\qquad b^2 = 25$

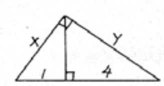
$a = 2$ $\qquad b = 5$

$2a = AC$ $\qquad 2b = BC$

$4 = AC$ $\qquad 10 = BC$

In △ABC, $(AC)^2 + (BC)^2 = (AB)^2$
$$4^2 + 10^2 = AB^2$$
$$116 = AB^2$$
$$2\sqrt{29} = AB$$

33 The leg is the mean proportional between the hypotenuse and seg of the hypotenuse adjacent to that leg.



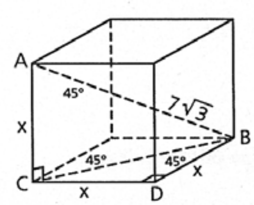
$\frac{5}{x} = \frac{x}{1}, x^2 = 5$

$\frac{4}{y} = \frac{y}{5}, y^2 = 20$

$\frac{x^2}{y^2} = \frac{5}{20} = \frac{1}{4}, \frac{x}{y} = \sqrt{\frac{1}{4}} = \frac{1}{2}$

34 The possible △s could have lengths of 2, 5, 5; 3, 4, 5; 4, 4, 4. Only 1 △ is a rt △, so the probability is $\frac{1}{3}$.

35



Since △BCD is a 45°45°90° △,

$BC = x\sqrt{2}$

So in △ABC,

$$(x\sqrt{2})^2 + x^2 = (7\sqrt{3})^2$$
$$2x^2 + x^2 = (49)(3)$$
$$3x^2 = (49)(3)$$
$$x^2 = 49$$
$$x = 7$$