

Test 2 is Friday. Today: every problem type on it.

- **Turn in Quiz 9** now.
- **Friday, October 30:** 15 questions, 200 points, 4 pages, 50 minutes.
- Every question is a skill from Quizzes 5 to 9.
- For each type, I work a **model**; then **you try** one on paper before the answer appears.

Where the 200 points are

- Logarithms (Section 4.3): **60**
- Angles and polygons: **60**
- Circles: **40**
- Interest (Section 4.2): **20**
- Degrees, minutes, seconds: **20**

The test, question by question

Q	Skill	Pts
1	Compound interest	10
2	Continuous compounding	10
3	Exponential → logarithmic form	15
4	Logarithmic → exponential form	15
5	Solve $\ln x = c$	15
6	Solve $b^x = c$ (change of base)	15
7	Parallel lines: equation, x , angle	20
8	Similar triangles: angle and side	20

Highlighted : new or changed this week, worth 70 points together.

Q	Skill	Pts
9	Trapezoid area (a slanted side is given)	10
10	Heron's formula	10
11	Decimal degrees → DMS	10
12	DMS → decimal degrees	10
13	Inscribed angle and arc length	20
14	Sector area	10
15	Linear speed of a wheel	10

Printed on the test, or from memory?

Printed on Test 2

- $A = P(1 + r/n)^{nt}$
- $A = Pe^{rt}$
- $\log_b a = \ln a \div \ln b$ change of base
- $A = \sqrt{s(s-a)(s-b)(s-c)}$, $s = (a + b + c)/2$

From memory

- $b^y = x \Leftrightarrow \log_b x = y$; $\ln x = c \Leftrightarrow x = e^c$
- trapezoid: $A = \frac{1}{2}(b_1 + b_2)h$
- DMS: $D + M/60 + S/3600$
- inscribed angle = $\frac{1}{2}$ arc
- radians = degrees $\times \pi/180$; $s = r\theta$; $A = \frac{1}{2}r^2\theta$
- $v = r\omega$, with $\omega = \text{rpm} \times 2\pi$

SECTION 4.2 · QUESTION 1 · COMPOUND INTEREST (QUIZ 5)

$$A = P(1 + r/n)^{nt}$$

r as a decimal · the test gives n : monthly ($n = 12$), quarterly ($n = 4$), semiannually ($n = 2$) · round to the nearest cent at the end

MODEL

\$2,500 at 3.5% compounded monthly ($n = 12$)
for 6 years

$$A = 2500(1 + 0.035/12)^{12 \cdot 6} = 2500(1 + 0.035/12)^{72}$$

$$A \approx \$3,083.25$$

YOU TRY

\$7,000 at 5.2% compounded quarterly ($n = 4$)
for 9 years

$$A = 7000(1 + 0.052/4)^{36}$$

$$A \approx \$11,143.92$$

SECTION 4.2 · QUESTION 2 · CONTINUOUS COMPOUNDING (QUIZ 5)

$$A = Pe^{rt}$$

"compounded continuously" means e , with no n · multiply $r \times t$ first · round to the nearest cent

MODEL

\$1,500 at 6.2% compounded continuously for 7 years

$$A = 1500e^{0.062 \cdot 7} = 1500e^{0.434}$$

$$A \approx \$2,315.13$$

YOU TRY

\$9,000 at 3.8% compounded continuously for 11 years

$$A = 9000e^{0.418}$$

$$A \approx \$13,670.29$$

The log is the exponent, even a fraction

$$b^y = x \Leftrightarrow \log_b x = y$$

$$25^{3/2} = 125$$

$$\log_{25} 125 = 3/2$$

MODEL

(a) Write $4^{3/2} = 8$ in log form. (b) Write $\log_9 27 = 1.5$ in exponential form.

(a) $\log_4 8 = 3/2$

(b) $9^{1.5} = 27$

YOU TRY

(a) Write $25^{3/2} = 125$ in log form. (b) Write $\log_4 32 = 2.5$ in exponential form.

(a) $\log_{25} 125 = 3/2$

(b) $4^{2.5} = 32$

$\ln x = c$ and $b^x = c$

$\ln x = c \rightarrow x = e^c$ · $b^x = c \rightarrow x = \log_b c = \ln c \div \ln b$ change of base is printed · four decimal places

MODEL

Solve. (a) $\ln x = 2.5$ (b) $3^x = 50$

(a) $x = e^{2.5} \approx 12.1825$

(b) $x = \log_3 50 = \ln 50 \div \ln 3 \approx 3.5609$

YOU TRY

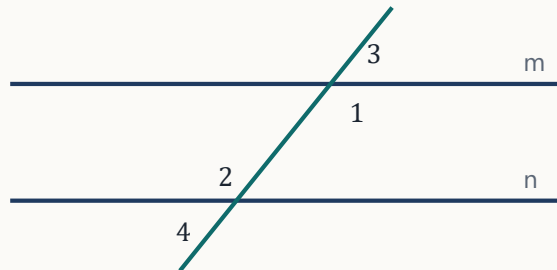
Solve. (a) $\ln x = 4.2$ (b) $6^x = 150$

(a) $x = e^{4.2} \approx 66.6863$

(b) $x = \ln 150 \div \ln 6 \approx 2.7965$

Equal or supplementary?

Equal: alternate interior (1 and 2), alternate exterior (3 and 4), corresponding. **Add to 180°:** same-side interior. Then substitute x back to get the **angle**.



MODEL

Alternate interior angles: $(2x + 27)^\circ$ and $(4x - 13)^\circ$

$$2x + 27 = 4x - 13 \rightarrow x = 20$$

$$\text{angle} = 2(20) + 27 = 67^\circ$$

YOU TRY

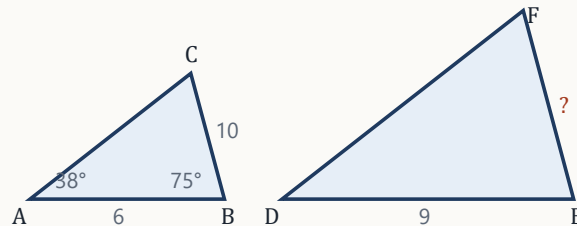
Same-side interior angles: $(2x + 20)^\circ$ and $(4x + 10)^\circ$

$$(2x + 20) + (4x + 10) = 180 \rightarrow x = 25$$

angles 70° and 110°

Match letters in order: $A \leftrightarrow D$, $B \leftrightarrow E$, $C \leftrightarrow F$

Matching angles are **equal**. Matching sides share one scale factor: keep one triangle on top, **$AB/BC = DE/EF$** .



MODEL

$\angle A = 38^\circ$, $\angle B = 75^\circ$; $AB = 6$, $BC = 10$, $DE = 9$.

Find $\angle F$ and EF .

$$\angle F = \angle C = 180 - 38 - 75 = 67^\circ$$

$$6/10 = 9/EF \rightarrow 6 \cdot EF = 90 \rightarrow EF = 15$$

YOU TRY

$\angle A = 49^\circ$, $\angle C = 76^\circ$; $AB = 14$, $BC = 21$, $DE = 12$.

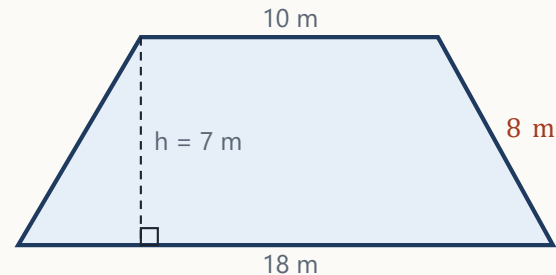
Find $\angle E$ and EF .

$$\angle E = \angle B = 180 - 49 - 76 = 55^\circ$$

$$14/21 = 12/EF \rightarrow EF = 18$$

Trapezoid: use the height, not the slanted side

$A = \frac{1}{2}(b_1 + b_2)h$, from memory. **h** is the perpendicular height (the dashed segment). The test also gives a **slanted side**: it is not used.



MODEL

Parallel sides 10 m and 18 m, slanted side 8 m, height 7 m

$$A = \frac{1}{2}(10 + 18)(7) = 98 \text{ m}^2$$

The 8 m slanted side is not used.

YOU TRY

Parallel sides 6.5 cm and 11.5 cm, slanted side 5 cm, height 4 cm

$$A = \frac{1}{2}(6.5 + 11.5)(4) = 36 \text{ cm}^2$$

Three sides: semiperimeter first

printed: $s = (a + b + c)/2$, then $A = \sqrt{(s(s - a)(s - b)(s - c))}$ · half the perimeter, not all of it

MODEL

A triangle has sides 5, 12 and 13. Find its area.

$$s = (5 + 12 + 13)/2 = 15$$

$$A = \sqrt{(15 \cdot 10 \cdot 3 \cdot 2)} = \sqrt{900} = 30$$

YOU TRY

A triangle has sides 7, 15 and 20. Find its area.

$$s = 21$$

$$A = \sqrt{(21 \cdot 14 \cdot 6 \cdot 1)} = \sqrt{1764} = 42$$

DMS both ways

decimal $\rightarrow$ DMS: $\times 60$, then $\times 60$ again (nearest second) · DMS $\rightarrow$ decimal: $D + M/60 + S/3600$ (four places) · show the conversion

MODEL

(a) 54.2875° to DMS (b) $31^\circ 12' 45''$ to decimal degrees

$$(a) 0.2875 \times 60 = 17.25'; 0.25 \times 60 = 15'' \rightarrow 54^\circ 17' 15''$$

$$(b) 31 + 12/60 + 45/3600 = 31.2125^\circ$$

YOU TRY

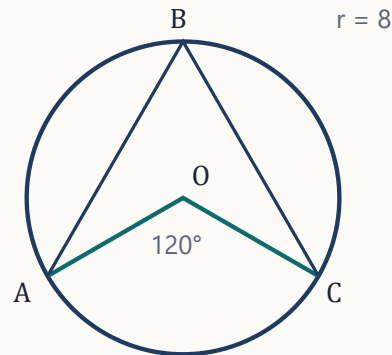
(a) 98.4561° to DMS (b) $17^\circ 53' 24''$ to decimal degrees

$$(a) 98^\circ 27' 22''$$

$$(b) 17.8900^\circ$$

Half the arc; radians before $s = r\theta$

central angle AOC = arc AC · inscribed angle ABC = $\frac{1}{2}$ **arc** · radians =
degrees $\times \pi/180$ · **s = r θ** with θ in radians



MODEL

Radius 8, central angle AOC = 120° . Find $\angle ABC$ and arc AC.

$$\angle ABC = 120 \div 2 = 60^\circ$$

$$120 \times \pi/180 = 2\pi/3; s = 8(2\pi/3) = 16\pi/3 \approx 16.76$$

YOU TRY

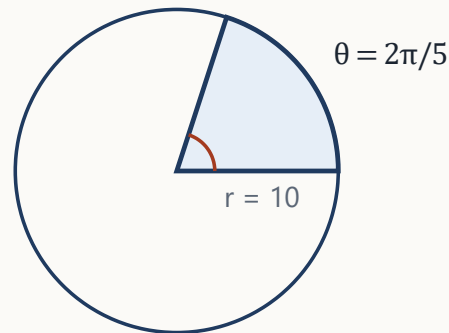
Radius 10, central angle AOC = 84° . Find $\angle ABC$ and arc AC.

$$\angle ABC = 42^\circ$$

$$84^\circ = 7\pi/15; s = 14\pi/3 \approx 14.66$$

$$A = \frac{1}{2}r^2\theta, \text{ and } v = r\omega$$

θ in **radians** · a diameter? **halve it** for $r \cdot \omega = \text{rpm} \times 2\pi \text{ rad per minute} \cdot v = r\omega$ in ft/min



MODEL

Sector $r = 10$, $\theta = 2\pi/5$. A wheel 5 ft in diameter at 160 rpm.

$$A = \frac{1}{2}(100)(2\pi/5) = 20\pi \approx 62.83$$

$$r = 2.5; \omega = 320\pi; v = 800\pi \approx 2513.27 \text{ ft/min}$$

YOU TRY

Sector $r = 6$, $\theta = 5\pi/4$. A wheel 3 ft in diameter at 210 rpm.

$$A = 22.5\pi \approx 70.69$$

$$r = 1.5; v = 630\pi \approx 1979.20 \text{ ft/min}$$

Where points are usually lost

Q1–2 Rate as a percent (5.2) instead of a decimal (0.052).

Q3–4 Swapping the exponent and the result in log form.

Q6 Change of base as $\ln(c \div b)$ instead of $\ln c \div \ln b$.

Q5–6 Rounding in the middle; round to four places only at the end.

Q12 Dividing seconds by 60 instead of 3600.

Q11–12 An answer with no conversion shown.

Q7 Solving for x but never finding the angle.

Q8 Matching sides by the picture instead of the letter order.

Q9 Using the slanted side as the height.

Q10 Using the full perimeter instead of s .

Q13 Doubling the arc instead of halving it, or degrees in $s = r\theta$.

Q15 Using the diameter as the radius, or leaving ω in rpm.

Before Friday

Tonight and Thursday

- Cover the "from memory" formulas and write them until you can without looking.
- Redo every "you try" from today without notes.
- Work the Test 2 practice PDF on the course page, then check it.
- Take the Test 2 readiness check on the review page until you reach 80%.

Friday, in class

- 15 questions, 200 points, 50 minutes, on paper.
- Printed: both interest formulas, change of base and Heron's formula.
- Bring a scientific calculator.
- Show your work inside each question's box.