

Sponsor's Copy

Test

GEOMETRY TEAM FOR MARCH 3, 1990 REGIONAL COMPETITION

1. PLACE 6 DISTINCT POINTS ON THE CIRCUMFERENCE OF A CIRCLE. IF EVERY POINT IS CONNECTED BY A LINE SEGMENT TO EVERY OTHER POINT, HOW MANY LINE SEGMENTS WILL BE DRAWN?

2. A RECTANGLE SOLID HAS DIMENSIONS 13 CM BY 17 CM BY 23 CM. WHAT IS THE SUM OF THE LENGTHS OF THE EDGES?

3. IN A TRIANGLE WITH THE SIDE LENGTHS 7, 10, AND 15, FIND THE LENGTH OF THE ALTITUDE TO THE LONGEST SIDE.

4. THE VOLUME OF A CUBE IS 21952 CUBIC UNITS. WHAT ARE THE DIMENSIONS OF THE CUBE?

5. IN AN ATTIC CORNER IS AN OLD RECTANGULAR FISH TANK FRAME WITH THE GLASS REMOVED. THE DIMENSIONS ARE 13 IN. BY 17 IN. BY 23 IN. AN SPIDER ON ONE CORNER DECIDES TO CROSS TO THE CORNER DIAGONALLY OPPOSITE. IN HOW MANY DIFFERENT WAYS CAN THE SPIDER GET TO THE OPPOSITE CORNER BY WALKING ALONG EXACTLY THREE EDGES OF THE FRAME?

FIND THE LATERAL AREA OF A RIGHT CONICAL SOLID WITH A HEIGHT OF 16 AND A RADIUS OF 12.

7. IF 2 MILES OF FENCE ENCLOSE A SQUARE PLOT OF 260 ACRES, THEN HOW MANY ACRES ARE IN A LARGER SQUARE THAT IS ENCLOSED BY 4 MILES.

8. SUPPOSE A CABLE FITS TIGHTLY AROUND THE EARTH. HOW MUCH ADDITIONAL CABLE WOULD NEED TO BE SPLICED IN SO THAT THE CABLE COULD BE RAISED 2 METERS ABOVE THE EARTH AT ALL POINTS?

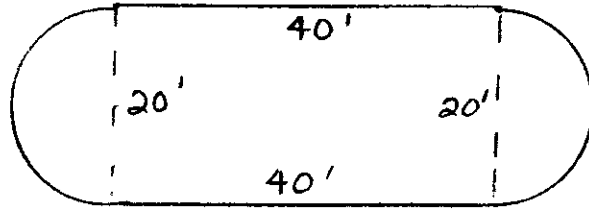
9. WHAT IS THE ANGLE OF ELEVATION OF THE SUN WHEN A TREE 105 FEET HIGH CASTS A SHADOW 150 FEET LONG?

| Angle | Sin | Cos | Tan |
|-------|-------|-------|--------|
| 0° | .000 | 1.000 | .000 |
| 5° | .087 | .996 | .087 |
| 10° | .174 | .985 | .176 |
| 15° | .259 | .966 | .268 |
| 20° | .342 | .940 | .364 |
| 25° | .423 | .906 | .466 |
| 30° | .500 | .866 | .577 |
| 35° | .574 | .819 | .700 |
| 40° | .643 | .766 | .839 |
| 45° | .707 | .707 | 1.000 |
| 50° | .766 | .643 | 1.192 |
| 55° | .819 | .574 | 1.428 |
| 60° | .866 | .500 | 1.732 |
| 65° | .906 | .423 | 2.145 |
| 70° | .940 | .342 | 2.747 |
| 75° | .966 | .259 | 3.732 |
| 80° | .985 | .174 | 5.671 |
| 85° | .996 | .087 | 11.430 |
| 90° | 1.000 | .000 | — |

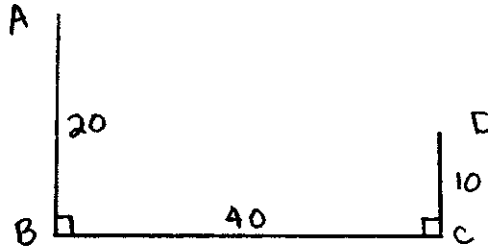
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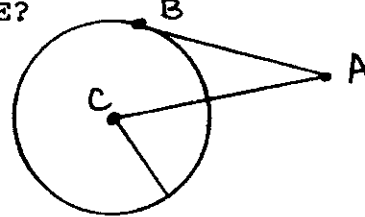
10. A SKETCH SHOWING THE DIMENSIONS OF AN ICE SKATING RING WITH SEMICIRCULAR ENDS IS ILLUSTRATED AT THE RIGHT. HOW MANY CUBIC FEET OF WATER ARE NEEDED TO FILL THE RING TO A DEPTH OF 6 INCHES? USE π AS 3.14.



11. WHAT IS THE SHORTEST LENGTH OF A JOURNEY FROM POINT A TO POINT D WHICH TOUCHES SOME POINT BETWEEN B AND C ALONG THE WAY?



12. THE RADIUS OF THE CIRCLE C IS 5 CM. THE TANGENT SEGMENT \overline{AB} IS 12 CM LONG. HOW FAR IS POINT A FROM THE CENTER OF THE CIRCLE?



13. WHAT IS THE AREA OF A SQUARE WITH DIAGONAL ONE UNIT LONGER THAN THE LENGTH OF A SIDE?

14. ON A SQUARE PIECE OF PAPER, DRAW THE LARGEST CIRCLE POSSIBLE. CUT THE CIRCLE OUT, DISCARDING THE TRIMMINGS. INSIDE THE CIRCLE, DRAW THE LARGEST SQUARE POSSIBLE. CUT THE SQUARE OUT, DISCARDING THE TRIMMINGS. WHAT FRACTION OF THE ORIGINAL SQUARE PIECE OF PAPER HAS BEEN CUT OFF AND THROWN AWAY?

15. FIND THE AREA OF A REGULAR HEXAGON WITH THE RADIUS OF 10.