378. A two-story office building is being planned in a temperate climate zone for the site shown. The site is bounded on two sides by streets.

The program requires a sustainable design, the ability to integrate both passive and active solar design into the building, an expansion of the building in the lengthwise direction, and the addition of more buildings as the site is fully developed. The architect is considering four locations for the building. The remainder of the site will be used for the additional buildings, landscaping, and parking. Which building location meets the program requirements?

(A) A  
(B) B  
(C) C  
(D) D

379. An architect is working on a preliminary planning study for an elementary school. The school is being designed for 750 students: 400 girls and 350 boys. From the following sample code, a total of _____ water closets are required. (Fill in the blank.)

Plumbing fixture requirements for pupils’ use:
- Water closets:
  - 1 per 100 males
  - 1 per 35 females
- Lavatories:
  - 1 per 50 students
- Urinals:
  - 1 per 30 male students
- Drinking fountains:
  - 1 per 150 students

380. An architect is planning a small day care center for three- to six-year-old children. The space needs are given in the table.

<table>
<thead>
<tr>
<th>area (ft²)</th>
<th>space</th>
<th>location requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>administrator office</td>
<td>near entry</td>
</tr>
<tr>
<td>150</td>
<td>assistant’s office</td>
<td>directly adjacent to administrator’s office</td>
</tr>
<tr>
<td>200</td>
<td>staff lounge</td>
<td>—</td>
</tr>
<tr>
<td>200</td>
<td>children’s toilets</td>
<td>adjacent to classrooms and outdoor play area</td>
</tr>
<tr>
<td>250</td>
<td>kitchen</td>
<td>adjacent to multipurpose room</td>
</tr>
<tr>
<td>250</td>
<td>storage</td>
<td>—</td>
</tr>
<tr>
<td>300</td>
<td>adult toilets</td>
<td>—</td>
</tr>
<tr>
<td>400</td>
<td>entry and reception</td>
<td>at drop-off area</td>
</tr>
<tr>
<td>500</td>
<td>classroom I</td>
<td>directly adjacent to outdoor play area</td>
</tr>
<tr>
<td>500</td>
<td>classroom II</td>
<td>directly adjacent to outdoor play area</td>
</tr>
<tr>
<td>600</td>
<td>multipurpose room</td>
<td>adjacent to storage</td>
</tr>
<tr>
<td>3000</td>
<td>outdoor play area</td>
<td>—</td>
</tr>
</tbody>
</table>

When designing the center, what are the most important issues that the architect must consider? (Choose the three that apply.)

(A) educational needs  
(B) relationship to outdoor spaces  
(C) toilet rooms  
(D) exits  
(E) children’s storage areas  
(F) multipurpose room location
376. The net assignable space includes the spaces used for specific functions (i.e., book stacks, reading rooms, offices, meeting rooms, and similar spaces). It does not account for circulation, toilet rooms, mechanical rooms, walls, and the like. The estimated 10% circulation space is part of the 80% efficiency ratio and is not included in the calculation.

The total gross area required is determined by dividing the net assignable area by the efficiency ratio.

\[ \text{gross area} = \frac{\text{net assignable area}}{\text{efficiency ratio}} \]
\[ = \frac{25,000 \text{ ft}^2}{0.80} \]
\[ = 31,250 \text{ ft}^2 \]

The answer is (C).

377. A long space can function for the initial design but a long space with separate assembly areas is not as flexible as a rectangular or square plan. Expansion is not mentioned. Although a flexible system of electrical and mechanical services is a good idea for any building shape, a grid system of support does not fully accommodate the needs.

The portion of the program given relates to providing timely flexibility as needs change. Future requirements are not known, except for electronics manufacturing. The architect plans for this facility by providing a large open space that can be reconfigured as required. A rectangular space most likely serves a linear assembly line and wide structural bays keep the space as unencumbered as possible.

The answer is (D).

378. Building location A is oriented in a suitable direction for passive solar design. Because it is located on a steeper slope, however, construction on location A is difficult and costly. Building location B allows for easy expansion and allows an adequate though not ideal orientation for passive and active solar design. Location B is in the middle of the site, however, making future development difficult. Building location D is oriented in the wrong direction for solar design (the length-oriented north to south) and runs across the contour lines, making construction difficult and costly.

Building location C integrates the given program requirements. It is oriented with the long direction slightly to the east of south, which is ideal for passive solar design in a temperate climate and active solar design. Placing the building at location C also allows for easy expansion. The building lies on a gentle slope, and the remainder of the site remains clear for future expansion. The possibility of placing the first building of the development in a prominent corner location is an added advantage.

The answer is (C).

379. This problem asks only for a calculation of water closets, so the information on lavatories, urinals, and drinking fountains can be disregarded.

\[ \frac{400 \text{ girls}}{35 \text{ girls}} = 11.42 \text{ water closets for girls} \]
\[ \frac{35 \text{ girls}}{350 \text{ boys}} = 3.50 \text{ water closets for boys} \]

Toilet fixture calculations are always rounded up, so 12 girls’ and 4 boys’ water closets are needed.

The answer is 16 water closets.

380. Toilet rooms, storage areas, and the specific location of the multipurpose room are not the most important spaces for a day care center. For any day care facility or school, educational needs and outdoor spaces are the primary concerns. Children must be able to evacuate the building safely, so exits are critical components of the design.

The answer is (A), (B), and (D).

381. For right-of-ways that are at least 15 ft, the surface parking lot and landscaping figure shows that walks must be a minimum of 5 ft and landscaped areas must be a minimum of 8 ft. For standard parking spaces, the required dimensions are given in the table row labeled 60°. Although the required width of the parking row access is 16 ft, the minimum required width of a one-way internal drive is 10 ft, as stated in the parking dimensions table footnote.
492. What distance from the foundation wall to the centerline of the dry well, as shown in Resource 5.2, should be used?

(A) 2 ft  
(B) 5 ft  
(C) 8 ft  
(D) 9 ft

493. The simple dry well selected for this project must be

(A) empty  
(B) filled with sand  
(C) filled with clay  
(D) filled with stone and gravel

494. A rain garden can help manage stormwater and reduce runoff pollution. Designed to absorb some or all roof runoff, a rain garden consists of a depression in the soil that is populated with plants and is located 9 ft from the foundation wall. If the architect uses a rain garden in the design of the new addition and the capacity matches the volume of the dry well, how long is the rain garden?

(A) 8 ft  
(B) 10 ft  
(C) 12 ft  
(D) 15 ft

495. The architect wants to draw a building section through the existing structure. So that the existing structure and the new structure are stable, the new foundation wall footing must be

(A) drawn 3 ft deeper than the existing footing  
(B) drawn immediately beneath the frost depth  
(C) shown at the new depth, and the existing foundation footing must be shown as underpinned  
(D) no deeper than the existing footing so the architect must revise the design before drawing both footings at the same depth

496. The second floor plan is shown in Resource 1. Designate the load-bearing walls by drawing the load-bearing wall symbol in the appropriate locations.

key: drag and place symbols

1.  
2.  
3.  
4.  

497. On the second floor plan shown in Resource 5.1, draw the correct joist span symbol in the appropriate framing span direction (horizontal, vertical, or diagonal).

498. In ascending order, place the uniform live load requirements of various elements of the residence.

- pitched roof  
- second floor  
- uninhabitable attics without storage

499. To support the second floor plan shown in Resource 5.1, the joists will be constructed of which types of products? (Choose the two that apply.)

(A) lumber joists  
(B) wood I-joists  
(C) laminated veneer lumber (LVL)  
(D) parallel strand lumber (PSL)  
(E) glued laminated members (glulam)  
(F) steel
Solve for length.

\[ V_R = w d_R L \]
\[ L = \frac{V_R}{w d_R} \]
\[ = \frac{29.44 \text{ ft}^3}{(2.5 \text{ ft})(1 \text{ ft})} \]
\[ = 11.78 \text{ ft} (12 \text{ ft}) \]

The answer is (C).

495. Because the new basement is designed to be deeper than the existing one, the existing adjacent foundation footing must be underpinned so as to not destabilize the structure. The contractor will need to underpin in alternate sections of approximately 3 ft. Concrete with rebar will be cast under the existing footing to a depth that matches the new footing depth. The new footing will also need to connect to the underpinning concrete using rebar.

The existing footing is below the frost depth. To remain economical, the new foundation should not be deeper than needed to underpin the existing foundation. Option (D) will not allow the existing footing to be underpinned properly.

The answer is (C).

496. The load-bearing walls are the long walls running in the horizontal direction of the addition. It is better not to overload the existing wall on the right side of the plan.

497. The new floor joists run perpendicular to the load-bearing walls. It is better to support the joists of the new framing on the new foundation and load-bearing walls running in the horizontal direction of the plan. The correct framing span symbol is shown. The symbol must be placed vertically and perpendicular to these new bearing walls.